PUBLIC WORKS

city county and state

april 1949

some of the articles in this issue

How Methods Improve Sanitary Fill Operation

Standard Procedure for Pavement Patching

Corrosion Prevention for Water Works

Mechanical Sludge Drying

How to Grow Grass on Roadsides

Quality Study of Individual Wells

★ ★ ★

Complete Contents Listed on Page 5

OHIO STATE UNIVERSITY

In tests conducted for a group of engineers last week, sewage sludge, garbage and refuse were destroyed simultaneously without smoke or odors in the municipal incinerator at Ewing Township, N. J. The plant, built by Nye Odorless Incinerator Company, 51 East 42nd Street, New York City, easily topped its rated capacity of 85 tons. It used no commercial fuel and was manned by a crew of two unskilled laborers. Outstanding features of the plant are its simplicity of design, the absence of moving parts and the elimination of unnecessary stoking. Operating costs are extremely low.

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how?

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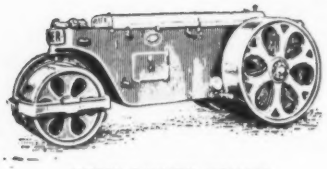
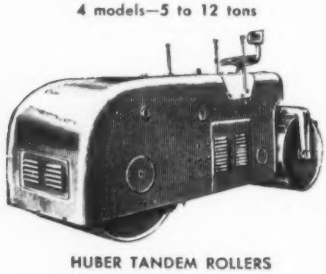
On Jobs Now Tying Up Big Equipment



HUBER 3-WHEEL ROLLERS
4 models—5 to 12 tons



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5 models—3 to 14 tons

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Other Huber road machinery built to make your construction work more profitable includes: 3-wheel automotive type road rollers, tandem rollers and trench rollers. Write today for descriptive bulletins and name of your Huber dealer.

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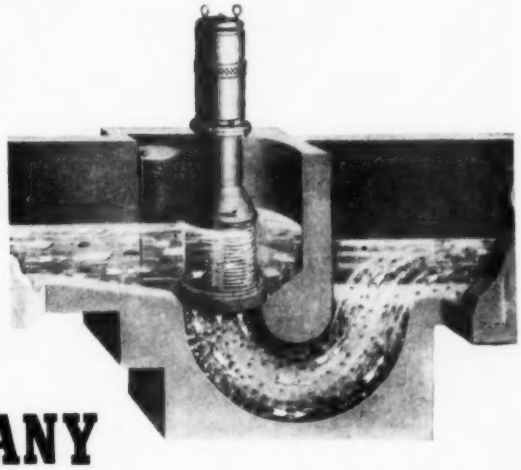
The CHICAGO Comminutor is always placed in an exclusively designed feeder channel. The hydraulic characteristics are such that accumulating solids cannot clog the drum slots; nor can rope-like material jam the drum. Comminution is rapid and positive. Sub-surface screening is continuous and automatic.

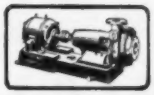


Cross section of a CHICAGO Comminutor channel illustrates a typical design of controlled discharge channel. Sheared small particles must pass through a maximum drum slot width of 3/8 in. Comminuted matter completely settles out in the primary tanks.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2348 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**



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APRIL, 1949

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PUBLIC WORKS

THE ENGINEERING AUTHORITY IN THE CITY-COUNTY FIELD

Edited by

W. A. HARDENBERGH and A. PRESCOTT FOLWELL

APRIL, 1949

GENERAL

The Editor's Page ... 6
Letters to the Editor ... 12
Leaders in the Public Works Field—E. R. Needles ... 28
Average Hourly Wage Rates, First Quarter, 1949 ... 49
Soil-Cement Base for Aggregate Stock Pile ... 50
New Equipment ... 80
The Engineers' Library ... 85
Engineers Wanted ... 90

HIGHWAYS, AIRPORTS AND CONSTRUCTION

Patching Pavements Better ... 25
How to Grow Grass on Roadsides. *By J. W. Lentz* ... 30
How Detroit Modernizes Its Streets. *By G. R. Thompson* ... 36
County Roads Stabilized With Asphalt. *By Claude M. Stover* ... 38
How Concrete Pavement Is Patched ... 39
Buffalo Maintenance Policies. *By K. S. Masters and J. H. Dimond* ... 56
City Pays for Sidewalk Snow Removal. *By C. H. Perry* ... 58
The Highway and Airport Digest ... 72
Road Sweeping Magnets ... 77

SEWERAGE AND REFUSE

New Methods Improve Sanitary Fill Operation. *By R. L. Anderson* ... 23
Sewer Maintenance Details ... 32
Refuse Disposal in Texas ... 44
Bid Prices for Sewer and Other Construction ... 48
Why Digester Gas Is Wasted at Winnipeg ... 49
Sludge Drying With Roto-Louvre Dryer. *By Morton Goldstein* ... 52
The Sewerage and Refuse Digest ... 60
Lagoon Treatment of Industrial Wastes ... 75

WATER SUPPLY AND PURIFICATION

Quality of Individual Well Supplies. *By H. E. Orford* ... 27
Laboratory Control of Carbon Dosage ... 28
Water Plant Lime Waste Used for Sewage Coagulation. *By Joe Williamson Jr.* ... 29
Essentials in Corrosion Prevention. *By E. B. Rodie* ... 33
Bid Prices for Laying 10" and 12" Cast Iron Pipe ... 48
Dehumidifying the Air in a Water Works Plant ... 50
The Water Works Digest ... 66
Operation of Chicago's South District Filtration Plant ... 76

Founded in 1896

THE EDITOR'S PAGE

With this issue PUBLIC WORKS enters a new era. Readers will find an ever-increasing degree of usefulness in its articles and editorials. But we are taking a broader view of what we and our readers are doing in order that we may serve them better.

OUR basic editorial aims and ideals remain as in the past: *to provide our readers with the best and most practical help in solving the problems of their everyday work.* Yet there will be increasing emphasis on the fact that we—and they—are not merely making a magazine or designing, building, maintaining and operating airports, highways, streets, sewerage facilities, waterworks, and similar activities. These things are but part of a vastly bigger job. For through them what we all are doing is building better communities—making a better, a more livable America.

By sticking to our own particular field of municipal, county and state public works in all of their integrated aspects, and by making sure each article we publish contains useful information, PUBLIC WORKS has emerged into a position of front-rank leadership. With this leadership go responsibilities which we recognize and accept. These go beyond the mere distribution of how-to-do-it information.

An important responsibility is to be a positive influence in outlining the horizons toward which the doers in this great field should travel. Another is to criticize when and where criticism is due. For only through constructive criticism can many faults be corrected.

Still another responsibility that a magazine like PUBLIC WORKS owes its readers is the greatest possible ease of grasping, assaying, and assimilating its editorial content. Layout, type faces, headings, illustrations, and article arrangement are all vital aids to this greater facility of use by readers; and when properly employed they also please the eye.

To this end PUBLIC WORKS has retained one of the leading industrial designers to re-design its monthly issues from both the functional and the artistic standpoints.

The result we believe will be a magazine not only more pleasing in appearance but one more useful than ever to our army of readers, and a stronger, more decisive force in the industry. So we present with pride an old friend with its broader outlook and improved dress.

Concerning This Matter of Gasoline Tax Diversion

Plenty of money is being collected through gasoline taxes to modernize and extend our highway systems and our city streets to meet our pressing post-war needs. Spent for such purposes, this money would facilitate the flow of traffic and commerce, reduce accidents and add to our national resources. Instead, it is being spent for purposes which, in many cases, are entirely foreign to the intent of the laws creating these taxes.

It will not be easy to divert the flow of this money back into the channels where it should rightfully go, but we believe it can and should be done. An essential is a road and street construction and improvement program which is constructive, sound and understandable by the voters, in which all sections and all communities will participate, and from which all will benefit. The actual highway needs of these sections and communities will have to be analyzed and a definite and reasonable program prepared covering a period of years and aiming at a definite goal.

Let each city and village prepare a 10-year plan for vitally needed street work, including widening and modernization, throughways and expressways, grade crossing elimination, surfacing and drainage, and the provision of adequate parking facilities. Let each county prepare also a 10-year program designed to facilitate safe and rapid use of its highway system—all-weather surfaces for farmers, safer and wider bridges, elimination of dangerous curves and intersections, and provision of adequate equipment for maintenance and snow removal. Let each state, unless it has already done so, prepare a similar 10-year plan for bringing its highway system up to the standards that will be needed ten years from now.

These three programs should then be screened and coordinated, and a year-by-year construction program worked out on a sound and feasible basis.

Such a program, presented to a state legislature, would certainly receive consideration. Since time is

required for a construction program to get under way, less money would be required in its early years, but eventually sound use could be made of all money derived from gasoline taxes.

In the past it has appeared that efforts to prevent gasoline tax diversion have too often neglected the old political adage that "you can't beat someone with no one." The only way to get gasoline tax money back into road work is to present a sounder and better plan for using it to the benefit of all of the people.

We do not know who can sponsor or direct such a program. Perhaps the Public Roads Administration or the ARBA could make a start; or maybe some state can step out and show the way.

And just to start the ball rolling, in case any city or any county has already made a survey of their needs and has developed from that survey a long-time plan for their work, we will pay $75 each for the two best articles, suitable as examples of how must be received before Aug. 1 and must describe to do it—one from a city and one from a county. These clearly how the survey was made.

Engineering Qualifications Should Be A Requisite

We are in receipt of a membership circular from one of the national societies in this field which states: ". . . please note that the member does not have to be an engineer to become a (member) of the Engineering Section."

In our opinion, this is all wrong. Policies such as these have been and are a fundamental cause of many of the difficulties now facing engineers in their fight for recognition as professional men. Without any intent to disparage the training or abilities of men who are not engineers, we do not think that they should be permitted to have the status of engineers through mere membership in a professional section or society which represents itself to be composed of engineers.

An alternative is to change the name so that it is clearly apparent that membership includes other than engineers.

Are Construction Costs Receding?

Recently the bids on concrete construction for two sewage treatment plants were surprisingly low. On a plant to handle about three million gallons per day, the overall low bid price for concrete was around $50 per yard; on the other job, which was about twice as large, the low bid for concrete was about $45 per yard. To those of us who have been estimating concrete at $75 per yard or even more, these bid prices are surprising. Both of these jobs were in the east.

Also, in the east, bids were recently opened on a 30-ton incinerator, complete with building and oversize chimney (to provide for future possible enlargement). The high bid was under $75,000 and the others quite substantially lower. Four bids were received; all were from recognized firms in this field.

Perhaps these are straws in the wind, or maybe they are merely deviations from the norm. Whichever they are, they are welcome.

Engineers and the Medical Service Corps

Though it has been in existence for nearly two years and has had organized being for some 18 months, the Medical Service Corps has done nothing, so far as we can find out, to meet the needs of inactive duty training for its reserve engineering and scientific personnel, nor to provide facilities for training pay for them.

The law creating a retirement system for reserve officers requires a certain amount of inactive duty training if the officer is to retain his commission on an active status and qualify eventually for retirement. This provision of the law imposes at least a moral obligation on the various corps of the army to provide suitable facilities whereby those reserve officers who desire to do so may retain their commissions. The engineers and other scientific personnel of the Medical Service Corps can listen to medical lectures—for the doctors have been well taken care of—or they can scout around and try to join forces with a Research & Development Group. However, these latter are few in number and widely scattered, so the great bulk of the non-medical professional personnel in the AMS are in a good way of losing their commissions unless something is done for them.

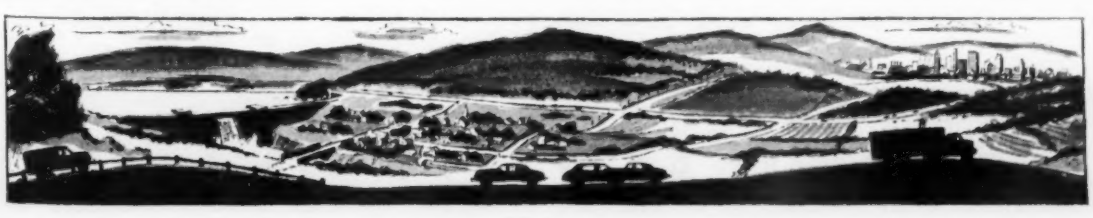
The matter of pay for attending training sessions on an inactive duty status also appears to be exceedingly far in the future for these men. The fumbling and bumbling—to put it kindly—which, from the very beginning, has characterized the Medical Department's handling of this highly trained and valuable personnel, appears still to be in the ascendancy.

No Substitute for Good Records

It's wonderful to have a foreman in the water department who remembers the exact location of every pipe and valve, and can go direct to the proper place without the necessity of digging out records when an emergency arises. And it is handy, too, to have a sewer department foreman who knows the precise location of that manhole that was covered up the last time Main Street was resurfaced.

But when these foremen are out of town, sick, or have passed on to the rewards that good foremen go to, what then? Lots of things can happen at fires or when a main breaks; and lots of costly pavement damaged and time wasted while the gang is probing here and there along Main St.

There just isn't any substitute for good records of the location of valves, manholes, pipes and other underground structures. And for that matter, we might expand this to include all municipal records and cost accounts as well.



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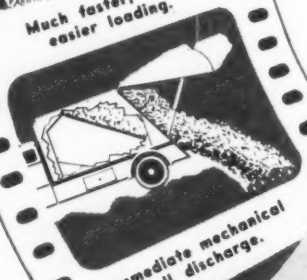

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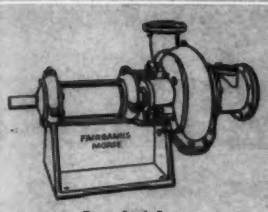
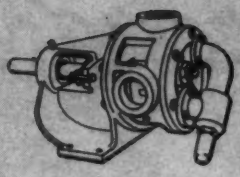
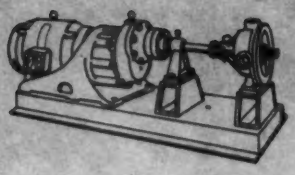
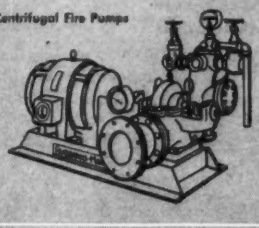

Paper Stock Pumps

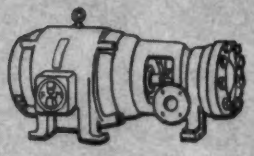

Frame Constructed Rotary Pumps

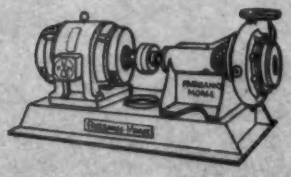

Rotary Pumps with Geared Head Motor Drive

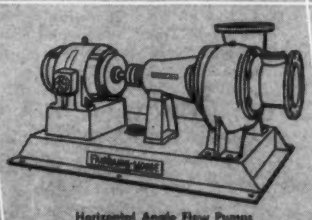
Vertical Propeller Pumps

Centrifugal Fire Pumps



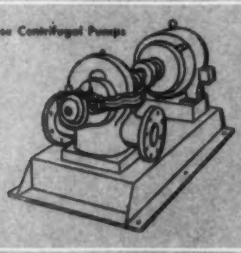

Two-Stage Builtogether Pumps

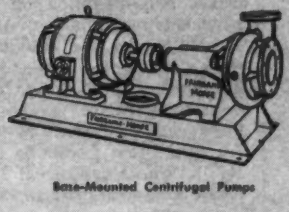

Horizontal Sewage and Trash Pumps


Horizontal Angle Flow Pumps

Vertical Close-Coupled Sewage and Trash Pumps

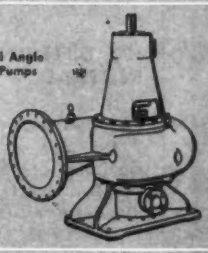
Split-Case Centrifugal Pumps



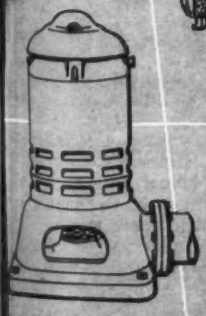

Base-Mounted Centrifugal Pumps

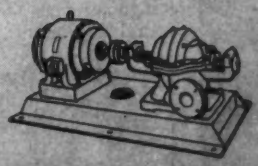
Vertical Sewage and Trash Pumps

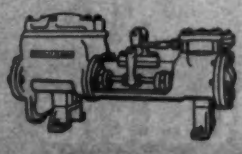
Vertical Angle Flow Pumps

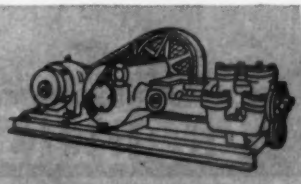


Builtogether Centrifugal Pumps


Deep Well Turbine Pumps


Two-Stage Centrifugal Pumps


Duplex Steam Pumps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Letters

HELPS FOR LICENSING

I am employed as a water works operator, and have to take an examination for my license. I was advised to send for your Water Works Manual and any other books you have for water works operation.

WM. LANG
Waldwick, N. J.

Copies of "The Operation of Water Treatment Plants" and "Water and Sewage Chemistry and Chemicals" have been sent to Mr. Lang.

CITY WORK WAS FASCINATING

The check for my article was a most pleasant unexpected surprise. As you will note, I am no longer connected with the City of Wheeling; the operation of the city manager form of government makes administration of the city departments most difficult. At times, however, I recall the fascination of the work with the city—for each day brought new problems.

Your magazine is excellent for all those connected with municipal work. Any time that I can be of service to Public Works or Colonel Hardenbergh, please do not hesitate to call on me.

JAY E. HENRY ENGSTROM & WYNN,
Contractors, Wheeling, W. Va.

IT'S DIFFERENT IN TEXAS

I have just read your article on "Arctic Sanitation" in the February, 1949, American Journal of Public Health. I find this article very instructive and interesting. How do you find time to do all these things?

V. M. EHLERS, *Director,*
Bureau of Sanitary Engineering,
Texas Dep't of Health.

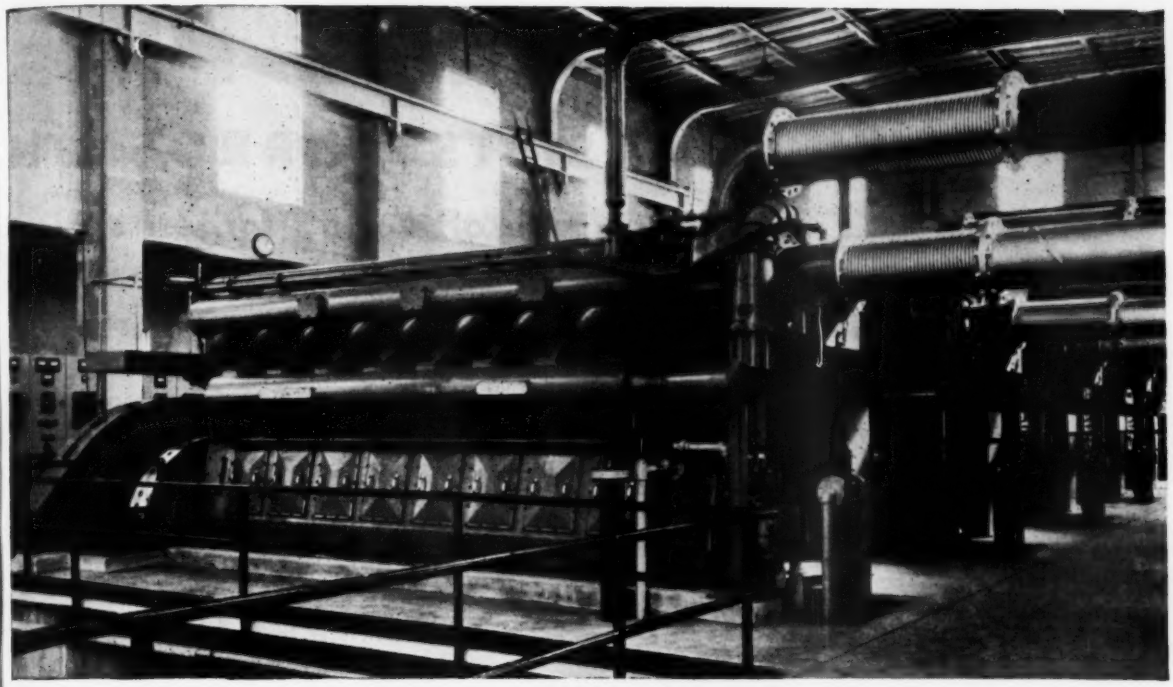
(Ed. Note: We got this dope the cold way, and how! You don't have weather like that in Texas.)

IT IS COMING SOON

I have received and thank you for the Sewerage Manual and the Water Works Manual; and I enjoy PUBLIC WORKS very much. I am writing especially to find out when the Highway Contractors' and Engineers' Manual will be forthcoming. If the present year's manual is not available, I would appreciate having one from the past year so that I can have it in my file. I find the information in the Manuals very helpful.

VIRGIL C. KNOWLES,
City Manager,
Holton, Kansas.

(Ed. Note: The 1949 Highway Manual will be published in May.)



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Superior Diesels are being used for more and more installations where a dependable source of power is important. Like the North Carolina town that recently built a power plant to meet its expanding industrial and domestic requirements. Five supercharged, model 80-GX-8 Superior Diesels driving 1,000 KW generators were chosen to power this important new plant.

There are some good reasons for this constantly growing acceptance. Superior Diesels are economical to operate and maintain. And they provide top performance day-after-day because of the following features:

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RESISTS CORROSION

. . . in one of world's largest sewers

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When you need special information—consult the READERS' SERVICE DEPT. on pages 85-89

y sooner than you think

Cast iron pipe is more readily available today than a year ago. You can get it sooner than you think. And here's why.

The cast iron pipe industry, in spite of raw material shortages, achieved in 1946, 1947 and 1948, the greatest three-year production program in its history. Those were the years of urgent demand for cast iron pipe created, to a large extent, by construction to meet a national housing emergency.

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Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Avenue, Chicago 3, Illinois.

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based on the findings of a survey conducted by leading water works engineers.

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DEMPSTER DIGGSTER

TRADE MARK

THE AUTOMOTIVE HYDRA-SHOVEL THAT-

- ★ Shovels and Loads any type material
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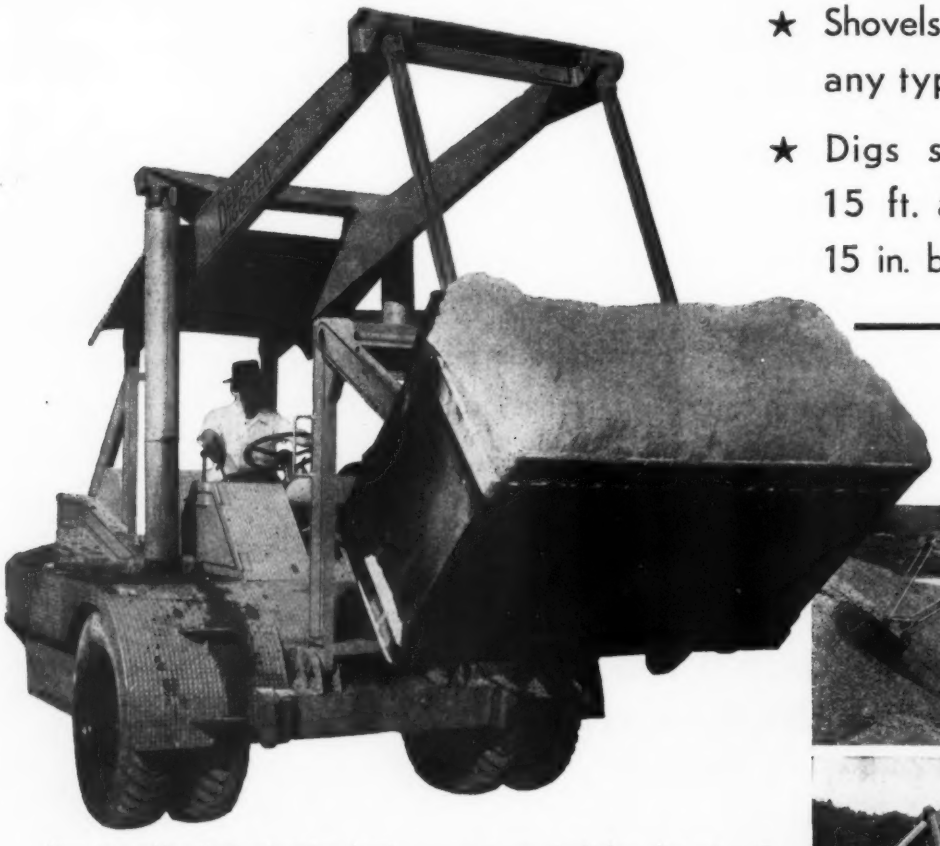

Here is a rubber tired automotive shovel that is equally at home in excavation work; in stockpiling, loading or on the road. It is the most compact and maneuverable, one-man-operated, rubber tired automotive shovel and loader available. It is the only machine built with simultaneous but independent hydraulic crowd and hoist action. Variable crowd action at any dipper position means it can dig lower—15 inches below grade. Exclusive hoisting action means it can dig higher—digs out a 15 ft. bank. Extraordinary dumping height and reach means easier loading, even distribution of load in the largest of trucks. Dempster-Diggster buckets are easily interchangeable. For digging, a 1 cu. yd. (heaped) bucket with hardened steel teeth is used. For loading work, stockpile buckets are available in 1¼, 1½ and 2 cu. yd. capacities. Hoisting, Crowding, Steering and Braking are all 100% hydraulic.

Large photo above shows close-up of Dempster-Diggster with 2 cu yd. stockpile bucket loaded. At right, top: Loading crushed stone. Center: Diggster dumps crushed stone into truck. Right, bottom: Digging out a high bank.

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You can't sue a subgrade for lack of support

When water-filled subgrades are guilty of non-support they cost you plenty in excessive maintenance. Then the only way to keep expensive pavements from "cracking up" is to drain the water out and keep it out. You can do this with ARMCO Perforated Pipe.

Efficient, economical subdrainage comes easy with ARMCO Pipe. Unskilled workmen quickly join long lengths with simple band couplers. There are fewer sections to lay—fewer joints to assemble. Installation goes fast and labor costs are low.

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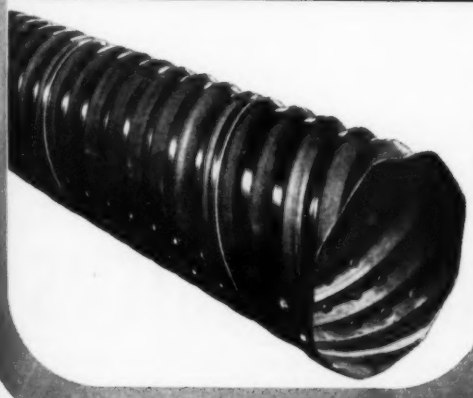
Use ARMCO Perforated Pipe for installing complete drainage systems or for patching up trouble wherever it occurs. Then you can be sure that valuable pavements are resting on a firm, dry foundation. You'll save maintenance dollars and motorists will enjoy a safe, smooth ride. Write for complete information. Armco Drainage & Metal Products, Inc., 1905 Curtis Street, Middletown, Ohio.



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PERFORATED PIPE

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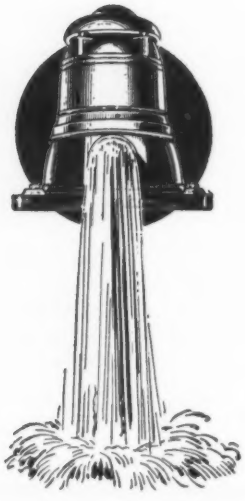

Small cities receive the same professional engineering, skillful workmanship and high quality equipment which is always provided for the largest cities. The only difference is in the size and capacity of the units installed. Many hundreds of small cities and villages already have their own Layne Well Water Systems. All are highly pleased with their sound investments; the economy of operation cost and the complete dependability of the units at all times. The owning of a modern, high efficiency well water system has enabled many to obtain new industries and at the same time to enjoy better fire and health protection.

Small as well as large cities are invited to make inquiries and to obtain catalogs about Layne's complete service which includes surveys, water strata explorations, well drilling, pump installations etc. for a complete, thoroughly tested and in operation well water system. No obligation. Address LAYNE & BOWLER, INC., General Offices, Memphis 8, Tenn.

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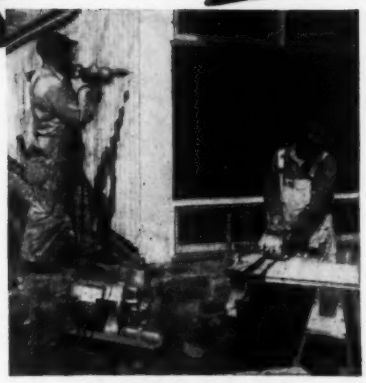

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For operating electric tools . . . both high-cycle and standard 110 volt . . . and for operating floodlights, Homelite Carryable Gasoline-Engine-Driven Generators are the ever-ready, ever-dependable favorites everywhere.

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Lightweight, compact, safe and easy to handle, these one-man, high-cycle electric chain saws have super-fast cutting power and are rugged and dependable for all types of cutting on both tree work and construction jobs.

HOMELITE PAVING BREAKERS

More and more the new 84-lb. Homelite Electric Paving Breaker is being enthusiastically received by those who want a fast, efficient breaker that is compact and easy to move.

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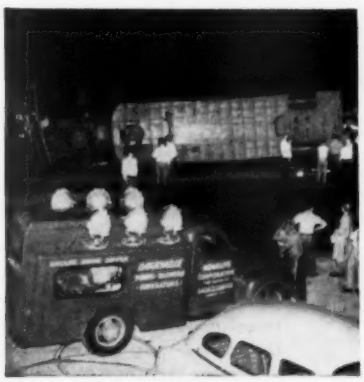

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WHEN THIS SUBWAY excavation began, one problem was to find trucks that could truck the muck 24 hours a day and set a profitable pace over a route, 128 city blocks long!

These International six-wheelers could—and did! They took the muck, 8 yards at a crack, to a dump 8 miles away. Sure, they did it like they were made for the job. They *were!*

This operation required specialized equipment built for the job. The heavy-duty 6 x 4 International KB-11-F was selected. Reinforced side rails withstand unusual shock stresses of big loads dropping into the bed from elevated loading hoppers. The special power divider with integral auxiliary transmission provides a low creeper gear for pulling out of bad spots and an axle ratio coordinated with the main transmission to provide cruising speeds required to meet the schedule. Because of the heavy loads hauled through heavily congested areas, large-size heavy-duty air brakes were installed to insure safe operation.

That's what International means when it says it builds trucks *specialized* for the job. International offers 22 basic models, with gross weight ratings ranging from 4,400 to 90,000 pounds. And it forms 1,000 different truck combinations from 'em—one for every load, road, and haul.

And International's service facilities are just as complete as the line of trucks it offers. 4,700 International Dealers and 170 company-owned Branches are waiting to wait on you . . . any place . . . any time.

So whether you're working on a subway or a skyscraper, a sewer or a sausage factory, International offers a complete line of trucks specialized to the job. A call to your nearest International Dealer or Branch will put you on the right track to the right truck. Why not put in that call right away!

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Tune in James Melton and "Harvest of Stars"
NBC, Sunday afternoons

INTERNATIONAL TRUCKS

INTERNATIONAL HARVESTER COMPANY • CHICAGO

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PUBLIC WORKS
★ MAGAZINE ★

APRIL • 1949 VOL. 80 • NO. 4

NEW METHODS IMPROVE

SANITARY FILL OPERATION

ROBERT L. ANDERSON
Supt. Public Works and Village Engineer, Winnetka, Illinois

COMPLETION of the second year of operation of the sanitary fill at Winnetka furnishes a comparison of the results on the two years' experience. Remarkably close agreement is noted between the two sets of figures and it is significant that a reduced unit cost of operation is indicated in spite of an increase in wage scale. The operating results for the first year were published in Public Works for June, 1948.

Description of Operation

As described previously, but with one important exception, the operation was conducted in the usual manner of filling a trench with compacted refuse to a level some five feet above the original grade and covering simultaneously with two feet of dirt provided by opening the next trench. A variation in the standard operating cycle, largely worked out by the fill operator, was instituted and in effect throughout the year with beneficial results.

This variation consists of making the fill from the bottom of the trench to final elevation in two lifts instead of one as in the usual procedure. The first lift is made to the original ground level and is covered with about six inches of earth, cinders or other dry material accumulated for the purpose. This lift is started from the permanent access road which forms one end of all the trenches, and as work progresses, the trucks are backed in over this lift with its light cover to reach the dumping point. Upon completion of this phase which fills the entire trench to ground level, the second lift to final grade is started from the far end and progresses back to the access road, being covered by the dirt excavated from the next trench.

Several important advantages are obtained by use of this routine:

1. The troublesome problem of truck access to the dumping face is solved by operating over the freshly-filled trench. The material remains relatively dry and firm even with the rest of the site a sea of mud.
2. The tractor placing and compacting the fill never has to operate down in the trench, which may be partly filled with water and very soft.
3. Good compaction is obtained in this lower layer by the continued traffic of the tractor and loaded trucks.
4. A shorter sloping operating face is in use since it is never more than half the final height and thus half the length. This is advantageous in several ways: (a) It is easier on the tractor which climbs only a short distance each trip; (b) Less trouble is experienced from blowing papers, since less raw face area is exposed and loads are dumped in a partially protected location; (c) The daily job of covering is reduced in magnitude so the operator can complete his work more quickly after the last load is dumped.
5. The dragline is in operation only half the time, since the trench is not being excavated during the first half of the cycle.

For our operation this modified operating cycle has proven to be very advantageous. The temporary thin cover over the first lift is suf-

● ***NEW OPERATING CYCLE builds lift to original ground level so trucks backing over fill aid compaction and operate on dry material.***

ficient to prevent odors for the short period of some two weeks that it is in use, and the continued traffic over it compacts it so that no rat trouble is experienced. The tractor working over it continuously keeps it in shape and well covered. The only disadvantage is that only one truck can be dumping at a time since two cannot pass on the narrow filled trench if the adjacent original soil is muddy, requiring the trucks to stay on the fill. For our operation this is unimportant, but it would be serious on a large fill with a heavy concentration of trucks unloading.

It is noted that wastes from the Village of Kenilworth were handled. This was done for some three months of the year as a temporary accommodation for which compensation was received.

An increase of 7.4% in the amount of Village household wastes and 10.2% in commercial rubbish is noted. A very small part of the former may be accounted for by new buildings but the major part is more likely a manifestation of the phenomenon that increased economic prosperity is attended by greater production of refuse. Increase in total material handled was 13.1%.

Since there was no change in equipment, depreciation expense remained constant for the two years. Other expense has been taken from Village records and is shown in Table II.

The following comments in connection with the foregoing are pertinent: (1) No costs for supervision or office overhead are included; (2) Labor costs are lower in spite of a rise in wage scale. This is accounted for by the elimination of some of the extra labor required the first year to provide drainage and access and to cope with frost. (3) Equipment costs show a marked increase. This is accounted for by the fact that little repair or replacement of worn parts was required during the first year because the units were new. During 1948 labor costs of service and repairs was materially higher; (4) Although total expenditures were a little higher in 1948, the 13.1% increase in material handled brought unit costs down to 92.8% of 1947 figures; (5) The unit cost of $0.795 per ton is equivalent to $0.159 per cu. yd. The price currently being charged for open dumping at the Lutter clay pit is $0.28 per cu. yd.

The second year of operation of Winnetka's sanitary fill has fully substantiated and extended the earlier satisfactory experience. The method is established as a sanitary and economical solution of the local problem of waste disposal. The following particulars are worthy of mention:

The improved operating procedure described has solved the difficulty experienced with access to the dumping face in a simple and economical way.

Interference of frost with the operation has been minimized by covering the area to be used during the frost period with a blanket of leaves and by use of a frost-ball for the dragline.

The detailed methods used here are not necessarily equally applicable to a larger-scale operation where there is a concentration of trucks to be unloaded.

Littering with wind-blown papers is still an occasional problem that is met only by hand-policing involving extra labor. Some more satisfactory solution is desirable.

Observations indicate that a rather even settlement of about four inches has occurred in the section that has been completed for one year or more.

Plans have been made to erect a building and utilize part of the completed fill as an auxiliary municipal service yard to relieve the congestion at the present yard.

TABLE II—COMPARISON OF EXPENSE AND DEPRECIATION

	1948	1947
Labor	$3,875.97	$4,181.60
Equipment	1,935.36	1,159.60
Material and Supp.	110.33	246.17
Depreciation	1,061.00	1,061.00
Total	$6,982.66	$6,648.37

TABLE I—COMPARISON OF 1947 AND 1948 OPERATIONS

	Avg. Wt. per cu. yd.	Est. Truck Box Volume 1948	1947
Mixed Household Wastes, Packed	650#/C.Y.	9,807 C.Y.	9,115 C.Y.
Mixed Household Wastes, Loose	475	13,458	12,601
Kennilworth Wastes, Loose	475	1,607	—
Ashes, Unmixed	1,000	—	152
Commercial Rubbish	200	18,465	16,725
Misc. Mixed Rubbish	475	696	277
Total		44,033 C.Y.	38,870 C.Y.

	1948	1947
Avg. Wt./C.Y.—Truck Box Volume	399#/C.Y.	400#/C.Y.
Area Covered	0.91 acre	1.32 acres
Avg. Depth Above Orig. Grade	6.50 ft.	3.74 ft.
Vol. Compacted Fill	9,500 C.Y.	7,965 C.Y.
Density, Compacted	1,850#/C.Y.	1,954#/C.Y.
Compaction, % Delivered Vol.	21.6%	20.5%

PATCHING PAVEMENTS BETTER

A Standard Operating Procedure

STANDARDS for patching operations on existing pavements are as necessary as standards in the design of new highways. The various pavement types, degrees of use, subgrade conditions and costs involved are all factors which must be considered in a well-engineered maintenance program. The following procedures for patching pavements were developed by the North Carolina State Highway and Public Works Commission.

RIGID PAVEMENTS

Patches in rigid pavements on North Carolina main trunk highways are constructed as outlined in the Highway Research Board's "Wartime Road Problem Bulletin No. 6" except that flexible type patches are used as specified below where breaks are relatively short or where the patch is of a semi-permanent nature prior to complete resurfacing.

Rigid Patches

Concrete. — Rigid patches made with concrete are constructed as follows: Excavate to a firm subgrade with a minimum of slab depth "D" plus 1" for concrete, plus 3" for granular insulation, or a total of D + 4" as shown in Fig. 1. When the failure is in the pavement widening and the thickness of the widening strip is considered inadequate, the thickness of the concrete patch may be increased to as much as D + 2". The concrete in the patch shall be insulated from the subgrade by at least 3" of topsoil, sand, screenings, or other granular material thoroughly compacted in place. To insure thorough compaction this insulating material should be damp but not wet.

Soil-cement.—Soil-cement (which, also, includes a friable clay-cement, screenings-cement, decomposed granite-cement, and other similar combinations) may be used as a substitute for concrete when patching pavements that have an asphaltic surface on a rigid base, or when patching concrete pavements that are to be covered with a bituminous wearing surface or a bituminous seal course. When the soil-cement is used in place of concrete the thickness of the soil-cement should be 1½ times the thickness of the concrete slab. Excavation should be carried to a firm subgrade with a minimum depth of 1½ inches (for bituminous top) + 1½D (for soil-cement) + 3" (for insulating layer between soil-cement and subgrade), as shown in Fig. 2. The 1½" bituminous top may be omitted (reducing the total depth of the patch by 1½") if the section of road being patched is to be resurfaced immediately with a bituminous mix at least 1" thick; and, provided further, the patch can be barricaded from traffic or primed with cut-back asphalt and covered with sand until the bituminous surface is applied. Where the prime coat with sand is applied, the patch should not be used by traffic for a period longer than 4 weeks.

The pavement surrounding the patch may be underpinned a maximum of 6 inches when pneumatic tampers are used for compacting the soil-cement. Practically any friable (readily pulverized) material except topsoil will be satisfactory for a soil-cement mix. The amount of Portland Cement required will vary from 8% to 12% of the mix. The Soils Laboratory should be consulted with proper proportions of the soil-cement mix.

Flexible Patches

Rigid pavements should be patched with flexible material (crushed stone or gravel): (1) where the longitudinal dimension of the patch is less than 6 feet; (2) where the break is adjacent to a transverse crack or joint and the longitudinal dimension of the patch is less than 8 feet; and (3) for all patches in an old pavement provided the pavement is to be resurfaced or relocated within three to five years. Some exceptions to the third condition are made, as when circumstances indicate a rigid type patch. When a flexible type patch (Fig. 3) is used on a road that is to be resurfaced, the patch should be placed at least 60 days in advance of the resurfacing in order to reduce settlement after resurfacing. Exca-

FIG. 1. RIGID PATCH—CONCRETE

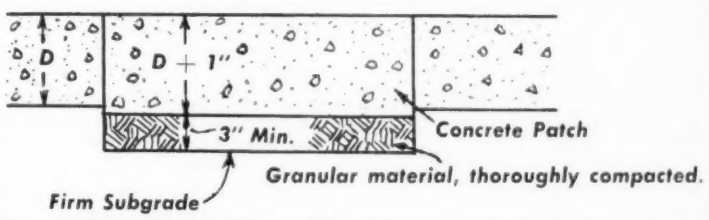


FIG. 2. RIGID PATCH—SOIL-CEMENT

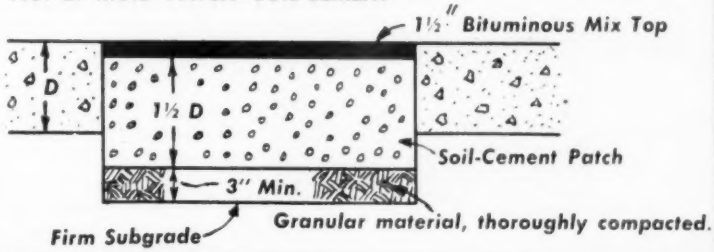
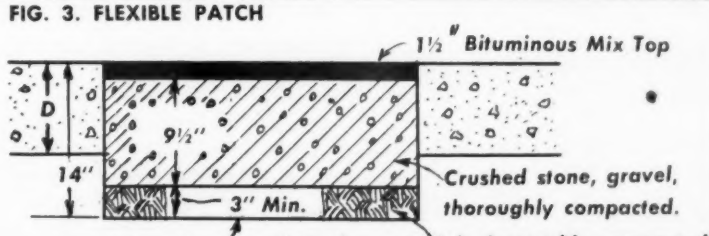


FIG. 3. FLEXIBLE PATCH



vation will be carried to a firm subgrade and a minimum depth of 14 inches (1½" ± top surface, plus 9½" crushed stone or gravel, plus 3" thoroughly compacted insulating layer between the crushed stone (or gravel) and the subgrade as shown in Fig. 3.

Crack and Joint Maintenance

When RC-2 is used for sealing, the following procedures should be followed:

1. Cracks and joints should be thoroughly cleaned of dirt and other foreign material.
2. Excess bituminous material on the pavement adjacent to the crack or joint should be removed.
3. Longitudinal cracks or joints one-half inch or more in width should be filled with sand cold patch; the cold patch should consist of a mixture of sand and cut back asphalt in the proportion of 17 to 20 gallons of RC-2 per ton of sand. The mix should be allowed to cure for two to three days before using. It should be thoroughly tamped in the crack. All surplus mix should be removed from the surface of the pavement.
4. Transverse cracks or joints one-half inch or more in width should be filled with a mixture of cottonseed hulls and cut back asphalt in the proportion of 3 to 5 pounds of dry hulls to one gallon of RC-2. After the mix has been thoroughly tamped in place, the surface of the crack or joint should be sealed by pouring with RC-2 and covering with dry sand.
5. Cracks and joints less than one-half inch in width should be poured with RC-2 and covered with dry sand immediately after pouring. Pouring should be repeated at intervals of 3 to 6 days if needed, until the cracks or joints are thoroughly sealed.
6. Care must be used in pouring the cut back asphalt to get the asphalt *in* the crack or joint, *not* on the surface of the pavement. Pouring pots should be checked to be certain the proper size nozzle is used. The nozzle opening should be small enough to place the hot asphalt in the pavement crack or joint.

Cut-Back asphalt is inflammable. RC-2 should be used at a temperature of 120 degrees F. and must never be heated above 140 degrees F.

When AP-5 or RT-9 is used for sealing, the procedure is practically the same as outlined above except that under paragraphs 4 and 5 the surface of the crack should be sealed with the heavier material (AP-5 or RT-9) and covered with dry sand. The re-pouring as referred to in paragraph 5 will *probably* not be necessary. AP-5 should be heated to between 275 and 325 degrees F. RT-9 should be heated to between 150 and 225 degrees F.

FLEXIBLE PAVEMENTS

The following methods are used for patching failures in surface treated roads where the base is top-soil, sand-clay, macadam, or similar material.

Using granular material over a firm subgrade.—The surface, base course and subgrade are removed to a firm subgrade, the total excavation being carried to a minimum depth of 10 inches. The excavation is refilled with soil type base course thoroughly compacted, or with a combination of 3" min. of granular material (top-soil, sand, screenings, or similar material) as an insulation on the subgrade, and 7 inches of crushed stone or gravel (traffic bound macadam quality), as shown in Fig. 4.

This type patch is recommended only for roads carrying light to moderately heavy traffic. When this type material is used it "must be thoroughly compacted" on a "firm subgrade."

Using soil-cement as a subgrade reinforcement over an unsatisfactory subgrade.—The surface and base course material is removed, salvaging material that is suitable for re-use; then excavation is continued below the bottom of the base course a minimum of 6 inches into the subgrade material. The subgrade is replaced with 6 inches of thoroughly compacted soil-cement; and the salvaged base material replaced immediately (no curing period needed); more material is added if needed; this is consolidated and the bituminous surface replaced to conform to the pavement adjacent to the patch. This procedure is shown in Fig. 5.

Using a soil-cement base.—The section where the bituminous treatment and the base course have failed, is removed, to a depth 10½" below the surface of the pavement. In the bottom of the excavation, 3" of top-soil, sand, screenings, or other similar granular material are placed; on top of this insulating layer, 6" of soil-cement is thoroughly compacted as a base course. The soil-cement is allowed to cure for 48 hours, under paper, wet bags, 2" of wet earth, or an application of liquid asphalt. It is then covered with 1½" of bituminous mixture (cold or hot mix) to conform to the pavement adjacent to the patch. This is shown in Fig. 6. (See page 44.)

BITUMINOUS PATCHING

Cold patch material can be prepared by (1) mixing sand with cut back asphalt (RC-2) or by (2) mixing sand and stone with cut back asphalt.

Sand Cold Mix

In localities where sand is available, a satisfactory cold patch material can be prepared by the use of sand and cut back asphalt. This type of cold patch material can be mixed by motor grader, pug mill, or any type traveling mixer. During warm weather it can also be prepared in

(Continued on page 42)

FIG. 4. USING GRANULAR MATERIAL

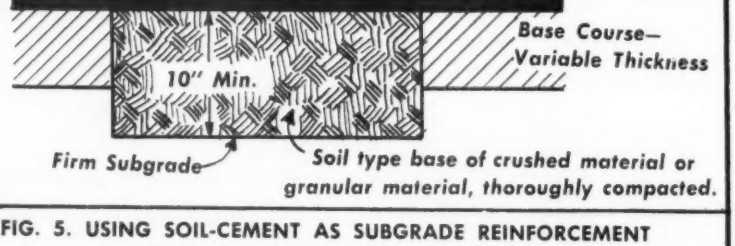
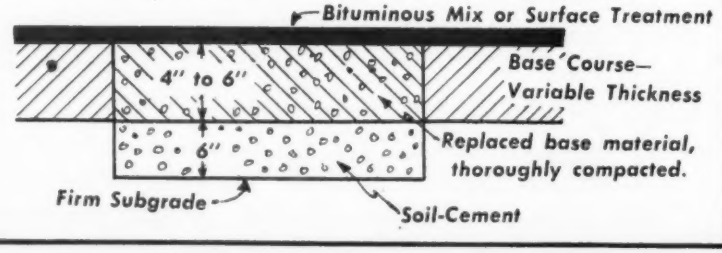


FIG. 5. USING SOIL-CEMENT AS SUBGRADE REINFORCEMENT



Study Shows Quality of INDIVIDUAL WELL SUPPLIES

HAROLD E. ORFORD
Research Engineer, Rutgers University

HOW good are the wells of a small country village where septic tanks and cesspools are the only method of sewage disposal?

Since the answer cannot be found in the general literature, a study was made of the bacteriological and chemical quality of the wells in a New Jersey rural village. The community selected has approximately 100 families, 90 individual wells, and 350 total population. Soil conditions are typical of many parts of the eastern seaboard in that the surface is a sandy loam underlain with a gravel sand. From such soils the waters are usually soft, acid, and corrosive and often contain objectionable amounts of iron.

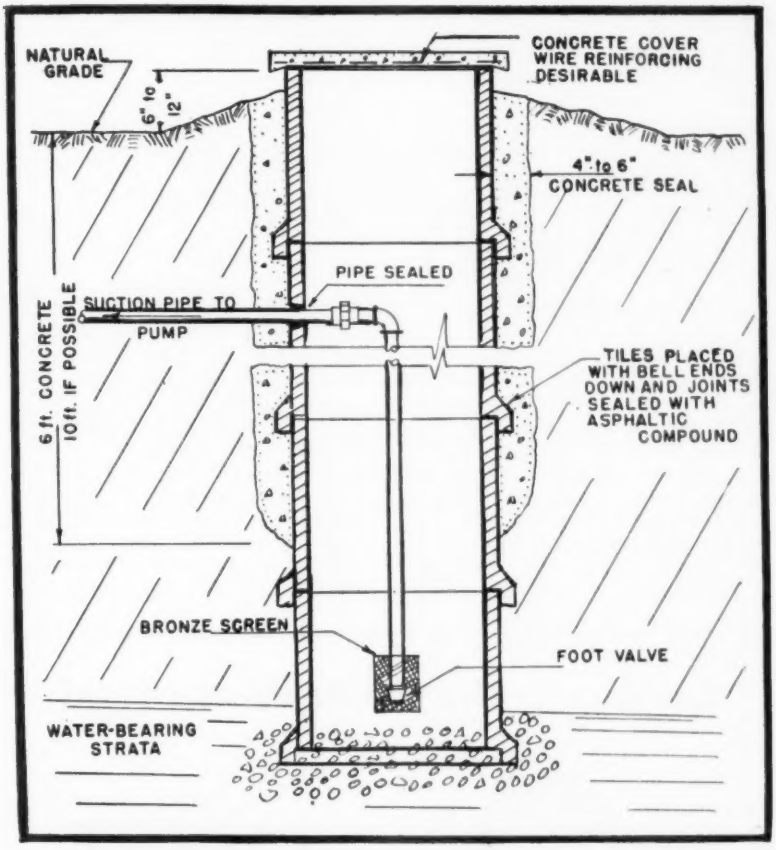
The entire village is located on two crossroads and covers an area 1.75 miles long by 0.5 mile wide to the extremities. The distances between wells and between wells and sewage disposal facilities vary widely, and are often less than 100 ft. in the central section of the town.

A list of the various types of wells encountered is shown in Table I.

TABLE I—WELL DEPTHS

Type	Number Studied	Average Depth
Dug	71	30 ft.
Driven	7	40 ft.
Drilled	6	92 ft.

Two studies have been made so far: One, the first week in September; and the other, the first week of the following June. These dates were picked in an attempt to determine whether there were any significant differences in well water quality after the summer months as opposed to the spring. In this section of New Jersey the mean annual rainfall is higher in the three summer months than in the three spring months. However, for the three months preceding each of the two surveys rainfall records show a 10% higher rainfall for the spring survey. It is also true that summer rainfall usually comes in a few heavy thunder storms with relatively dry periods intervening, whereas spring rainfalls are more uniformly distributed. This condition existed at the time the surveys were made, and it can be safely said that the ground had a higher degree of saturation during the spring.


NATURAL GRADE
6" to 12"
CONCRETE COVER WIRE REINFORCING DESIRABLE
4" to 6" CONCRETE SEAL
PIPE SEALED
SUCTION PIPE TO PUMP
6 ft. CONCRETE 10 ft. IF POSSIBLE
TILES PLACED WITH BELL ENDS DOWN AND JOINTS SEALED WITH ASPHALTIC COMPOUND
BRONZE SCREEN
FOOT VALVE
WATER-BEARING STRATA

● ***PROTECTIVE FEATURES for shallow or dug wells are designed to prevent pollution of the well by contaminated surface waters.***

Bacteriological Quality

The most interesting results of the survey are the comparisons between the bacteriological quality of dug wells and the driven or drilled wells.

The results are tabulated herewith. Table II comprises those wells that do not pass the United States Public Health Service bacteriological standards for potable water. Table III excludes those wells of which the contamination was so slight that the waters might pass the standards if a sufficient number of samples were taken.

TABLE II—PERCENT OF WELLS NOT PASSING THE U. S. PUBLIC HEALTH SERVICE STANDARDS

	Dug	Driven	Drilled
Sept. (Fall)	57	25	14
June (Spring)	56	14	20

TABLE III — PERCENT OF WELLS NOT PASSING—EXCLUDING WELLS SHOWING SLIGHT CONTAMINATION

	Dug	Driven	Drilled
Sept. (Fall)	50	25	14
June (Spring)	45	14	0

From the results of the bacteriological anaylsis it can be seen that water from almost 60% of the dug wells and about 20% of the other types should be considered unsafe for drinking, and that the incidence of pollution is three times as high for dug wells.

Since the average depths of the dug and driven wells studied are approximately the same it can be inferred that the higher incidence of pollution in dug wells is due not to lack of depth but to difficulty in preventing surface water infiltration, either around the sides of the well or through inadequate covers.

Chemical Characteristics

On the average there was not much difference in chemical quality among the three types of wells. The waters were generally found to be soft, acid, and iron-bearing. The survey showed a significant difference only in the hardness of the dug well waters, which were found to average about double the hardness of the water in the other types of wells. This is undoubtedly due to local geological conditions and is not typical of the usual experience in which deep well waters are generally found to be harder.

There was little chemical change in the well water between the fall and spring surveys, except in the acidity or carbon dioxide concentration and the iron centent. The acidity was found to be 50% higher in all wells in the spring than in the fall, while the iron increased 75% in the dug wells and decreased 20% in the others from fall to spring.

Since not all well waters show an increase in iron with increased acidity, the additional iron was probably due to greater infiltration from iron-bearing sands near the surface and not to any appreciable increase in corrosion of the plumbing systems.

The variation in chemical composition of the dug well waters between fall and spring was much greater than for the other types. This variation was not indicated by average values for alkalinity and hardness, because increases in some wells were balanced by decreases in others. When alkalinity and hardness changes in individual wells were considered it was found that more than 75% of the dug wells and only 20% of the driven or drilled wells showed a significant change (more than 30%).

These changes in the chemical composition of dug well waters can be explained by the greater infiltration of surface waters. Improperly sealed dug wells would receive water from various depths, depending on rainfall and ground water saturation, and would thus have a more variable composition than driven or drilled wells, which receive a more uniform water from a constant depth.

From the results of our study so far, we can conclude:

(1) That the average dug well is three to four times as likely to show pollution as a driven or drilled well;

(2) That, on the average, difference in bacteriological and chemical quality of well waters between dry and wet seasons is not significant; and

(3) That infiltration of surface waters into dug wells contributes to the increased incidence of pollution, and to the greater variation in chemical composition for individual well waters.

These conclusions agree with the recommendation of many authorities and agencies that wells should be properly sealed to prevent surface water infiltration and particularly that dug wells should be provided with tight waterproof covers and have impervious side walls to a depth of at least 10 feet.

Journal Series Paper of the N. J. Agricultural Experiment Station, Rutgers University, The State University of New Jersey, Department of Sanitation, New Brunswick, N. J.

Leaders in the Public Works Field

COL. E. R. NEEDLES

New President of the American Road Builders' Association, Col. Needles is a member of the consulting engineering firm of Howard, Needles, Tammen & Bergendorff, of New York City. During World War II, he served with the Corps of Engineers of the Army as Lt. Colonel and Colonel, and was awarded the Legion of Merit medal for superior service. He has long been interested in professional and educational organizations for engineers and has been an active leader in an important branch of the public works engineering field.

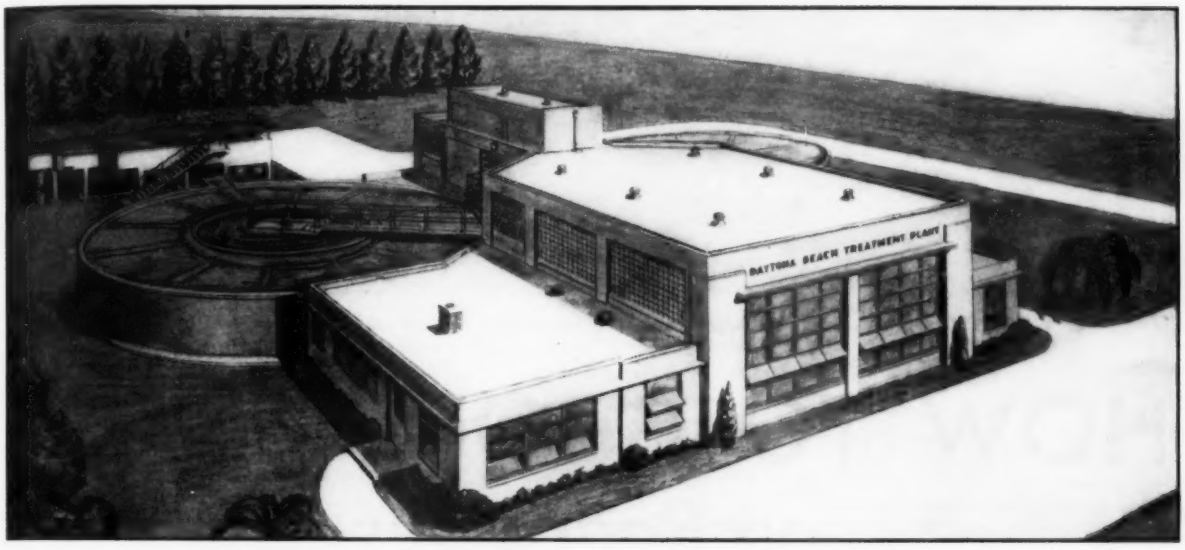
Laboratory Control of Carbon Dosage

Rapid changes in the quality of the raw water entering the Chicago South District Filtration Plant on Dec. 5, 1948, required rapid changes in the carbon dosage to control taste and odor. Between 7 AM and noon, the odor threshold of the raw water rose from 4 to 80 Ch., and the free ammonia from 0.012 to 0.212, and dropped again quickly so that by 3 PM it was approximately back to the 7 AM condition. During the 10-hour period from 7.45 AM to 6 PM, eight changes were made in carbon dosages, from 30 lbs. per mg. to 500 lbs., and then back to 70 lbs. A total of 26,452 lbs. of carbon was applied in eight hours, with a maximum of 6,185 pounds in one hour. At no time during the day did the odor threshold of the filtered water leaving the plant exceed a value of 3, indicating complete odor control throughout the day. This remarkable job was described briefly by Oscar Gullans, Director of the Filtration Laboratories in "Pure Water" which is published by Chicago's South District Filtration Plant. During 1948, the plant used 2,756,782 pounds of activated carbon.

WATER PLANT LIME WASTE

Used For Sewage Coagulation

JOE WILLIAMSON, JR., Russell & Axon, Engineers



● ***SEWAGE TREATMENT plant designed to serve 70,000 population requires a space only 127 feet long by 90 feet wide.***

"THE Daytona Beach Process" may be termed, fundamentally, a high rate chemical precipitation plant using low cost chemical coagulants. The first plant of this type will be completed and placed in operation during April. Previously, one of the special combination coagulation and sedimentation basins has been in operation. While final laboratory results are not yet available, observation indicates that plant scale results will be equal to those obtained in the pilot plant experiments.

If the results are as successful as preliminary work indicates, considerable savings in initial cost may result; and even this may not be the most important economic aspect of the process. Space requirements are so small that such a plant can be constructed entirely underground, as in a park or under a street, or in a commercial or residential district. This possibility presents a new concept in sewage collection system design. The need for large interceptors might be eliminated by the use of several well-located plants.

Consideration is now being given to the possibility of constructing underground plants of this type, or of placing them in gas-tight buildings above ground in heavily built-up areas. Naturally, such considerations must depend on conclusive plantscale results.

Factors in Coagulation

The principal chemical coagulant utilized in this process is calcium carbonate. In Daytona Beach, large volumes of this material is obtained free of cost from the local municipal water softening plant. This presently useless by-product sludge from the water plant contains several times the amount of calcium carbonate required, but the excess carbonate presents no problem and has considerable advantages. Pilot plant experiments indicated an overall BOD removal of 70% to 80% with only one hour detention in a specially designed combination coagulation and sedimentation basin. Although results to be expected indicate twice the BOD reduction of conventional primary treatment, initial cost of the "Daytona Beach Process" is much less than normal primary treatment.

Before the Florida State Board of Health would approve construction of this Daytona Beach plant, it insisted on a manufacturer's surety bond being posted to guarantee specified BOD and suspended solids removal. Such a surety bond was posted by the manufacturer (Infilco, Chicago) supplying the special process equipment. This manufacturer has, for some time, been experimenting with calcium carbonate treatment of certain industrial wastes. More detailed information on this subject is available in an article by A. A. Kalinske (Director of Development, Infilco, Inc.). "Wastes Treatment in Pilot Plant Using Water-Softening Sludge," which is available in reprint form.

Pilot plant tests indicated that there might be considerable value in the combined carbonate and sewage sludge removed in the process. It is apparent that the combined raw sludge (without digestion) de-waters readily on vacuum filters. This has long been recognized in conventional chemical precipitation plants using high cost "pebble lime" or hydrated lime. Moreover, in addition to the valuable normal organic matter, this process sludge contains the calcium carbonate which is actually agricultural lime. Many soils require both organic material and lime. After the Daytona Beach plant is in full operation, experiments will be conducted on this sludge, tending toward the development of a satisfactory commercial fertilizer.

● ***WELL SEEDED** berm and shoulders serve the important functional purposes described below.*

HOW TO GROW GRASS *on Roadsides*

J. W. LENTZ
O. M. Scott & Sons Co., Marysville, O.

TODAY'S highways stretching cross-country like taut ribbons necessitate one cut and fill after another. The resulting slopes and backslopes bordering these roadsides call for a blanket of turf to hold the soil and gravel in place.

Like a new home, naked without landscaping, the modern highway is far from complete without berms, shoulders and backslopes planted in a uniform turf of grasses and clovers. But roadside grassing also has a functional purpose just as important as adding the finishing touches to highway appearance. Here are some of its uses:

1.—The grass sodding resulting from engineered seeding controls erosion, protecting the future of the highway.

2— It provides a safe mat onto which vehicles may drive when it is necessary for them to leave the hard surface.

3—It minimizes dangerous rutting and annoying dust. Dust control is exteremely important from a safety standpoint.

4—A sod of grass absorbs excess rainfall and retards the run-off water which without sod may seriously damage the highway, requiring repairs.

Start With the Soil

Subsoil—Modern highway cuts expose subsoil, shale and gravel. The secondary or foundation soil used in highway fills is oftentimes subsurface waste soil and rocks on which grass must be started. As far as drainage is concerned both surface and subsurface drainage are usually adequate due to provisions specified in the highway construction plans.

Grade Soil—The soil on which the turf is to become established should be made up of local topsoil of good tilth. Occasionally satisfactory soil is present on the site. It is very important that some topsoil be used. A 4 to 6-inch layer is ideal. Less than this amount will usually reduce the results proportionately. A two-inch layer of topsoil blended into the subsoil is considered the very minimum.

Seedbed Preparation—Light weight roadbuilding equipment, such as maintainers and tractor-powered farm type implements like discs, drags, lime and fertilizer spreaders, make possible mass preparation of the seed bed. With this equipment the topsoil is mixed and blended to a depth of six inches as the final grade is established.

Photos courtesy of Ohio Dept. of Highways

Fertilization—Specifications in highway seeding projects recognize the value of preseeding applications of fertilizer to the seed bed. Such fertilizers should be for the most part high in nitrogen and complete in phosphorus and potash. A minimum of 400 pounds per acre of a standard 10-6-4 fertilizer should be applied. Some projects may require as much as 800 to 1000 pounds of such a mixture per acre, if the soil is poor.

Watering—The application of water to the seed bed is especially important when the seeding is to be followed by mulching. In the absence of rainfall, it is desirable to build up the soil moisture by supplying at least 200 gallons of water per 1000 square feet which is equivalent to 8700 gallons per acre or 0.3 inch rainfall.

Selecting the Seed

It is well to select mixtures and blends of grass seeds and legumes best suited for specific purposes. Experience has proven that the same mixture will not do as well on berms and shoulders as it will on slopes and backslopes or vice versa. Various State Highway Departments have their own grass seed specifications.

Typical Mixtures called for in certain Highway situations are as follows:

Shoulders and Berms

50% Kentucky Bluegrass
15% Perennial Ryegrass
20% Alsike
15% Hairy Vetch

Backslopes

35% Kentucky Bluegrass
15% Perennial Ryegrass
25% Yellow Sweet Clover
25% Hairy Vetch

Sandy Soil Seed

25% Chewings Fescue
35% Alta Fescue
25% Perennial Ryegrass
5% White Clover
10% Alsike

Vetch is a vine-type legume that is winter hardy. Most all varieties used are perennial and the Ryegrass is included to produce early top-growth, and vigorous rootgrowth, protecting the surface from erosion while the slower sprouting varieties are getting under way.

Alta Fescue, a comparatively new species, is a promising variety because of its deep root system and its ability to thrive under extreme conditions of moisture, drouth and temperature. Many times Alta Fescue has been substituted for Kentucky Bluegrass and is often found to do even better. Good quality of seed is essential in all roadside planting since growing conditions are not likely to be ideal.

Protecting New Seedings—Mulches play a more important role in roadside planting than in any other type of grass seeding. For the conservation of moisture and the control of erosion on slopes, it is common practice to protect new seedings along highways with a mulch of some type.

Although there are ideal planting periods in each locality, it is seldom possible to schedule highway construction so that the road work is completed at just the right season to get the best planting results. Special methods are therefore needed to help overcome the disadvantages of poor timing as far as grass planting is concerned.

Thus, roadside seedings following highway construction projects are quite apt to come during the least favorable time of year. During the hottest summer or in midwinter, mulches are necessary to protect the new planting by retaining soil moisture and hastening grass development.

There are many things that may be used as a mulch but so far straw, hay and similar types of litter are the only ones that have been found to be economical to use on large scale highway seedings. The economy of their use is sometimes questioned in view of the amount of labor involved in correctly placing them according to specifications.

Recently asphalt has been proposed and tested as a mulch for new grass seedings and shows considerable promise of being both economical and easy to handle.

Erosion of backslope is confined to section where no mulch was used.

Blower helps apply uniform straw mulch to newly seeded berm.

Protective asphalt coating seals in moisture and holds seed in place.

Distributor can apply asphalt mulch on many freshly seeded areas.

Well-planted shoulders add to safety and appearance of this highway.

Types of Mulch

Straw Mulch—The purpose of a mulch is to hold the seed in place, protecting it from rain and wind erosion while it germinates. The use of straw and similar types of litter requires a considerable amount of labor as it is common practice to tie these down with cords and pegs. There is also an additional labor cost when specifications call for its removal, as is sometimes the case.

When straw is allowed to remain in place after the grass gets a good start its decomposition reduces the nitrogen in the soil available to the grass. This results in the turf assuming a starved appearance. It quite frequently loses the headway that it first gained under the protective straw cover.

Asphalt Mulch—Many of the disadvantages of a straw mulch are avoided when asphalt protection is used. An asphalt emulsion or cutback is easier to apply. It involves much less labor and is quicker to use because the contractor is usually well acquainted with the operation of asphalt spreading equipment.

An asphalt emulsion disintegrates in place without upsetting the carbon-nitrogen ratio. Comparative tests indicate that grass is much healthier and has a more vigorous green color when protected with a properly applied asphalt material.

Asphalt is a practical protective covering for new grass seedings because:

1—It speeds up seed germination and new growth. Asphalt retains soil warmth and due to its black color absorbs more of the sun's rays than does loose, plain soil, making its use especially beneficial in pre-season or early spring and post season, late fall or early winter, plantings.

2—Asphalt saves the loss of seed and fertilizer. Like a tent, the asphalt coating sheds water, protecting the new seedlings from deluging rains. This saves much cultural loss of the seed and fertilizer. The great value of this latter function is yet to be fully realized.

In the absence of adequate rainfall it is well to add soil moisture in advance of asphalting. Two hundred gallons per 1000 square feet equiva-

● ***PRESSURE spraying unit reaches all parts of right-of-way for weed control.***

● ***WEEDS on backslope of ditch are uniformly sprayed with the aid of this attachment.***

lent to 8700 gallons per acre or 0.3 inch of rainfall, is the recommended amount. So far only asphalt cutbacks (mixtures with kerosene or similar solvents) have been used in highway berm and shoulder seedings.

Considerable experimentation has been done with asphalt-water emulsions and this material promises to have certain definite advantages over the asphalt dissolved in organic solvents.

Some of the advantages of an asphalt water emulsion over asphalt cutbacks are:

1—Water is more readily available and less expensive than the organic solvent used in cutbacks.

2—Asphalt emulsions are less apt to prove injurious to grass seed or plants that happen to be established. Common solvents used in asphalt cutbacks have proven toxic in some instances to grass and legume seeds.

3—Emulsions are more easily applied in ordinary temperatures. No heating or precise temperature control is necessary as in the case with organic solvent and asphalt mulch.

4—Tests with asphalt-water emulsions indicate such preparations have a better capacity than the cutbacks to penetrate the soil. This is advantageous.

This new method of protecting highway seedings on slopes and shoulders is being tested further and merits careful consideration due to the many advantages it apparently offers at the present time over the older and more common practice of straw mulching.

Trends indicate that road building tools, methods, materials and equipment may be used more efficiently and effectively to establish highway turf on slopes, berms, shoulders and backslopes, as well as in roadside parks. Such machinery tends to eliminate tedious hand labor and reduce expense.

Sewer Maintenance Details

In sewer maintenance, the most logical place to start is the manhole, said Karl Fuss, Superintendent of Water and Sewerage of Mattoon, Ill., at an operators' conference. The first idea about a manhole is to be able to get into it safely, so the steps and ladder rungs should be inspected for corrosion. In Mattoon, ladders are carried on the sewer maintenance trucks. But before descending into the manhole, adequate ventilation is necessary and an air blower is a "must" for all jobs.

Manholes should be inspected for tightness, infiltration, shape of invert, and its condition. Although there is not much that can be done to change the invert at the time, notes should be made for future reference to which manholes and sewers need attention and for what reasons.

Infiltration is a serious problem in many localities. The best measure of infiltration can be obtained by installing weirs at manholes and measuring night-time flows. Further information on the condition of shallow sewers can be obtained by use of a mirror and flashlight attached to a board which is floated down the sewer. Not only are leaks and infiltration detected, but roots and near failures may be located. Many repairs can thus be made before extensive cleaning of the sewers.

After a successful attempt to seal the cracks in a wooden water tank with Bentonite (a moisture-absorbing clayey rock powder), it was decided to try it on a particular sewer laid in a former swamp. The line, 1200 feet long and 12 inches in diameter, flowed one-half full before other sewer connections were made. With increased connections it flowed full and then surcharged. A mud-jack (used by contractors to insert mud under pavements to raise them) was rented at $25 per day. After water jetting the mud-jack pipe into the ground on either side of the cement-jointed pipe to a depth of 3 to 3½ ft. below the ground surface, a 1:1 water slurry of Bentonite was introduced. The operation required the services of two men for a day and a half, and 300 pounds of Bentonite. Within a short period of time the flow was reduced to 200 g.p.m. Inspection after two years indicated no perceptible increase in infiltration.

Measuring Soil Moisture

A permanently installed device for continuously measuring soil moisture at any given depth below the surface of the ground or road has been developed at the Michigan Agricultural Experiment Station. It is a nylon electrical resistance unit in which electrodes are located. The nylon readily absorbs moisture from the soil and gives it up, tending to be in equilibrium with the moisture content of the soil. The electrical resistance of the nylon unit varies with its moisture content, and is measured with a special portable wheatstone bridge. It measures moisture from saturation to almost air dryness.

ESSENTIALS

In Corrosion Prevention For Water Works

EDWARD B. RODIE

YEARLY losses due to corrosion of water mains have been estimated at $40,000,000; and the losses due to corrosion of all types many times as great. In municipal water works about 90% of the metal used is in the distribution system; therefore, particular attention will be given to methods for the control of corrosion of pipes.

Theory of Corrosive Action

All of the common metals react with oxygen but in many cases the progress of the reaction is markedly slowed or entirely stopped by the formation of thin, adherent films of inert oxides. Under certain other conditions these films do not adhere closely to the metal or are porous or soluble, thus permitting corrosion to continue. In most natural waters corrosion is not uniform over the entire metal surface. Oxidation (rust) occurs at the "anodic" areas and oxygen or hydrogen ions are reduced at "cathodic" areas. This action is termed electro-chemical attack, indicating that the chemical reactions are accompanied by a flow of electrons, with separate reactions occurring at the anode and cathode.

Fundamental Equations. — In an acid media (pH less than 4.5) the reactions are:

At the anode:

$$Fe = Fe^{++} + 2e \quad (1)$$

(*Iron*) (*Ferrous ion*) (*electrons*)

At the cathode:

$$H^{+} + 2e = H_2 \quad (2)$$

(*Hydrogen ion*) (*electrons*) (*gas*)

The free electrons from the anode flow through the metal to the cathode where they take part in reaction (2).

In the neutral pH range and in alkaline solutions the reactions are shown by equations (3) and (4) at right.

Since reaction (4) produces the hydroxyl ion it will be seen that water in the cathodic area becomes more alkaline as the reaction continues. Whether in acid, neutral or alkaline media, the reactions take place in pairs, with the rate of electron production at the anode equal to the rate of electron assimilation at the cathode. Thus the reactions are interdependent although they may occur at points separated a considerable distance.

Effect of pH.—In the pH range normally encountered in potable water supplies the rate of corrosion is nearly independent of the pH of the water because of the formation of a protective layer of hydrous ferrous oxide which maintains the pH value of the metal surface at approximately 9.5 regardless of pH of the water. Corrosion can proceed only as rapidly as oxygen diffuses through this layer, and the layer is kept in repair by the formation of corrosion products. It should be noted that at pH values below 4.5, in which range evolution of gaseous hydrogen (reaction 2) begins, corrosion increases rapidly with increasing acidity. As pH increases above about 9.0 corrosion rates decrease rapidly.

Effect of O_2—As seen from equation (4) oxygen is required for corrosion in potable waters, the rate usually being proportional to the dissolved oxygen concentration. However, the reduction of oxygen concentration in a particular area does not mean that corrosion will stop in these regions. Instead they will become anodic to areas which receive more oxygen and will lose ions of iron according to reaction (3). This so-called "differential aeration" causes corrosion at areas low in oxygen such as under sludge and scale accumulations, at the junction between stagnant and moving regions, and near the water line of elevated tanks. In those areas near the anode, to which oxygen diffuses, reaction (5) may occur:

At the anode:

$$Fe = Fe^{++} + 2e \quad (3)$$

(*iron*) (*ferrous ion*) (*electrons*)

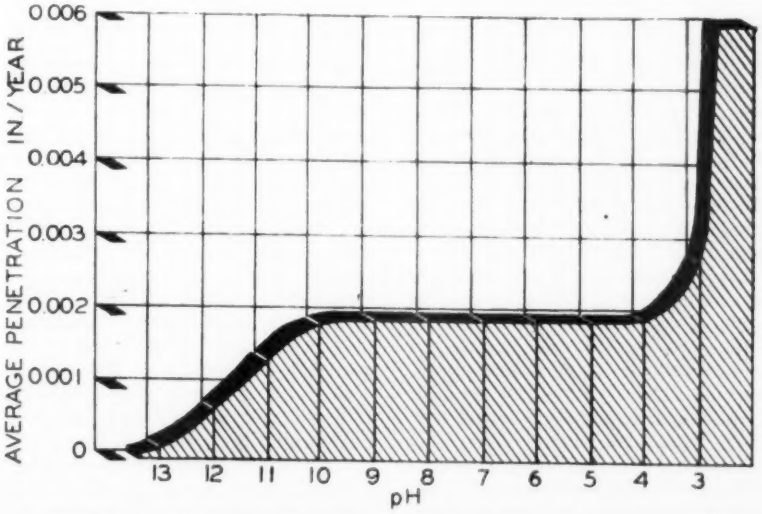
At the cathode:

$$\tfrac{1}{2}O_2 + H_2O + 2e = 2(OH)^{-} \quad (4)$$

(*gas in solution*) (*water*) (*electrons*) (*hydroxyl ions*)

$$4Fe^{++} + 3O_2 + 6H_2O = 4Fe(OH)_3 \quad (5)$$

(*ferrous ion*) (*oxygen*) (*water*) (*solid*)



● ***EFFECT of pH on corrosion of mild steel at 22°C in water containing 1 ml. O_2 per liter. Penetration is at constant rate over wide middle range due to presence of alkaline hydrous ferrous oxide film.***

The resulting precipitation of the solid ferric hydroxide as an adherent film will protect the surface. This occurs most readily in high pH waters.

In general, in a near-neutral water with oxygen present, iron in areas to which oxygen has access will become cathodic and will not corrode, while areas where oxygen is in lower concentrations will become anodic and will corrode.

Effect of Alkalinity

Systems having an excess of $CaCO_3$ (calcium carbonate) tend to precipitate calcium carbonate and thus form a protective coating. The existence of a $CaCO_3$ excess is indicated by the saturation index (Langelier Index) which relates total solids, total alkalinity, pH and calcium content of the water. When conditions are such that the pH of saturation of $CaCO_3$ is less than the actual pH of the water, scale formation will develop. Thus high pH waters have a greater tendency to deposit insoluble scale in a continuous and protective layer, and are less subject to corrosion. Since the cathode reaction (4) increases the pH, scale forms most readily in cathodic areas. The presence of dissolved CO_2 will retard the formation of the protective layer, hence corrosion is accelerated. Excess dissolved carbon dioxide beyond that needed to keep calcium carbonate in solution makes the water even more aggressive.

Pitting.—In anodic regions from which oxygen is isolated by deposits of scale or other accumulations, the following reaction takes place:

$$\underset{(ferrous\ ion)}{3\,Fe^{++}} + \underset{(water)}{4\,H_2O} = \underset{(solid)}{Fe_3O_4} + \underset{(hydrogen\ ion)}{6\,H^+} + \underset{(gas)}{H_2} \qquad (6)$$

The hydrogen ions produced increase the acidity to such an extent that all protective films are dissolved and pits quickly formed. Penetration in these areas may proceed at ten times the rate of overall corrosion. Water pipe may fail by perforation at pits before more than 5% of its weight has been lost.

Tuberculation. — Corrosion products above pits accumulate in the form of tubercles on the inside of water mains. By shutting out oxygen and external water they initially accelerate pitting action but may in time become so impervious that corrosion is retarded.

Tubercles are particularly objectionable because they greatly increase pipe friction and may even stop the flow of water in a small pipe. Care must be taken in cleaning to remove completely all tubercles so that the pits beneath can be properly treated. After cleaning, it may be desirable to provide a protective lining for the pipe.

Effect of Water Velocity.—Motion of water in pipes may increase the corrosion rate by carrying oxygen to the metal; however, inhibiting chemicals contained in the water may counteract this. When pumps and other equipment are not properly designed, extremely high velocities may produce areas of very low pressures where dissolved gases are liberated and vapor bubbles formed. The damage caused by formation and collapse of these bubbles is called cavitation erosion. In addition, when turbulence or high impingment velocities occur protective films are eroded.

Soil Corrosion. — Corrosion rates on the exterior of buried metal surfaces depend on both the acidity of the soil and its alkalinity. Drainage conditions are also important. In well drained soils corrosion often becomes negligible after a few years. The nature of the soils in areas where new lines are to be laid should be investigated to determine if they are of a corrosive type.

Stray Currents.—Electrical currents from any grounded device, such as a street railway system, may enter a pipe and flow through it a considerable distance before re-entering the ground. These are called stray currents. As pointed out above, corrosion is an electrochemical action in which electrons produced in the fundamental reactions flow between the anode and the cathode. In the same manner, direct current from an outside source flowing through a pipe will produce an anode and a cathode where the reactions of corrosion will take place. In most cases the anodic reaction results in solution of the metal. A current of one ampere flowing from a pipe for one year will theoretically remove 20 pounds of iron.

Galvanic Action.—When dissimilar metals are immersed in an electrolyte, an electrical potential is created between them, and current will flow if they are electrically connected. This current will produce galvanic corrosion of the anodic member of the couple in the same manner as stray currents originating from a source outside the pipe.

Effect of Bacteria.—Bacterial slimes which partially cover a metal surface may produce anodic areas by differential aeration. Iron bacteria may consume soluble ferrous iron, disturbing the normal formation of protective films. Sulfate-reducing bacteria are anaerobic, hence flourish in tubercles and help shut out oxygen from the pits beneath.

Protective Measures

The basic aim of all protective measures is to prevent the occurrence of one or more essential parts of the electrochemical action of corrosion. The various methods by which this is accomplished will be discussed briefly.

Protective Coatings.—It has been stated that 50% of the steel pipe lines in the United States have protective coatings. The majority of these are bituminous coatings, usually reinforced by one or more layers of rag or asbestos felt sandwiched between coats of bitumen. Other coatings are made of bituminous mastics, in which graded aggregates take the place of reinforcements. The protective mastic coating is extruded over the pipe. Cement coatings on the outside of pipes are also used effectively.

For pipe linings a bituminous enamel coat about 1/16 inch thick is usually applied hot by the centrifugal process. Cement linings are also applied by the centrifugal process. In addition, devices have been developed which will apply a continuous lining of cement mortar to lines in place.

Whatever type of surface protection is used, it must be both impervious and continuous to function effectively. Pinholes or "holidays" can be the origin of intense local action, particularly when stray currents are encountered. Pipe that is coated at the factory must be handled carefully to guard against damage to the protective coating. Electrical methods for testing the continuity of the coating at the site have been developed.

Soluble Inhibitors

By definition an inhibitor is any substance which, when added in small amounts to the corrosive environment of a metal effectively decreases the corrosion rate. The action of the inhibitor is to stifle electrochemical action by depositing very sparsely soluble products on the metal surface. They are called anodic or cathodic inhibitors according to the class of eletrochemical action they stifle.

Anodic Inhibitors.—Soluble chromates, borates, silicates, phosphates and hydroxides will all protect iron and steel to some extent. Of these, only the silicates and phosphates are suitable for use in potable waters.

Some hazard is associated with the use of anodic inhibitors because they must be employed in sufficient quantities or they may restrict but not entirely stifle anodic action. Since they have no effect on the cathode reaction, and since the amount of iron dissolved (reaction 3) is equivalent to the cathode reaction (reaction 4) sufficient inhibitor must be added to prevent any anode reaction.

The amount of inhibitor required is affected by the presence of other ions, notably chlorides and sulfates, in the solution. The proper dosage must be determined by trial. During laboratory tests of inhibitors, the solution must be constantly agitated to simulate the condition of water moving through pipes and accelerating the rate of supply of inhibitor to the metal surface.

Cathodic Inhibitors.—As mentioned above under "Effect of Alkalinity," calcium carbonate tends to be deposited in cathodic areas because the cathode reaction increases the alkalinity of these regions. The resulting scale decreases the oxygen supply to the metal and reduces the rate of the cathode reaction. Thus calcium carbonate scale acts as a cathodic inhibitor. The most effective use of cathodic inhibitors involves the careful adjustment of alkalinity and pH to deposit a light coating of calcium carbonate which will interact with iron salts to produce dense, clinging rust in which the calcium-iron ratio is about 1 to 10.

Cathodic inhibitors are not as effective as anodic inhibitors because of the greater areas to be protected and the relative porosity of cathodic deposits.

Electrolytic Protection

Protective coatings are designed to isolate mechanically entire metal surfaces from corrosive environments.

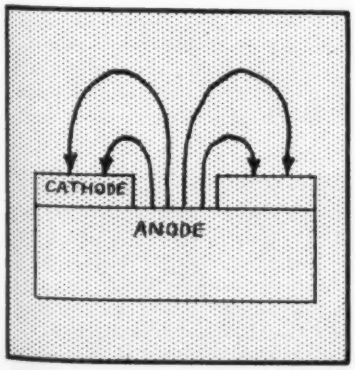


Diagram of local action represents paths of galvanic current from anodic pit to surrounding cathodic area. Impressed current of opposite sign will prevent this action.

Soluble inhibitors chemically isolate either the anodic or cathodic areas. The final protective measure widely used in water systems, electrolytic protection, is aimed at counteracting the electrical phase of the electrochemical reaction.

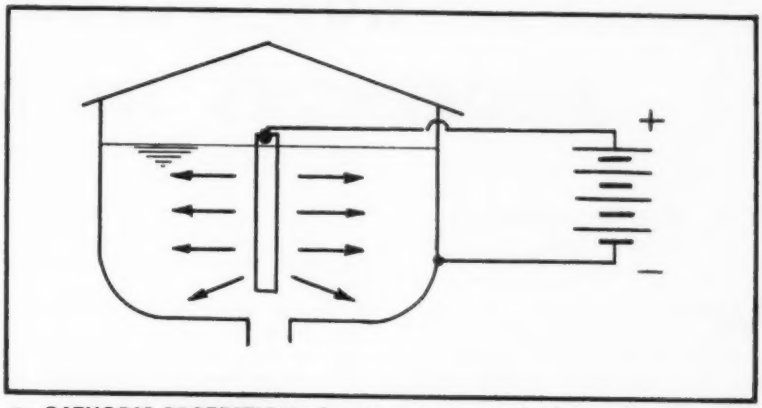
To provide protection in this manner, direct current is used to make the entire metal surface cathodic. The source of current may be either the potential caused by galvanic action between the metal to be protected and a more active metal in the same environment, or it may be direct current supplied by a rectifier or other suitable source.

The electrochemical reactions of corrosion involve the flow of current between the anode and the cathode, with the circuit partly through the metal and completed through the electrolyte (water). This current is caused by the dissimilar potentials produced by the cathode and anode reactions, and must be uninterrupted if the reactions are to continue. The fundamental reactions involving solution of iron (reactions 1 and 3), involve transfer of electrons. The galvanic current caused by corrosion may be overcome by an equal or greater current in the opposite direction impressed on the system from an outside source. When this condition prevails the anodic areas on a metal surface become cathodic, and solution of iron in these regions ceases.

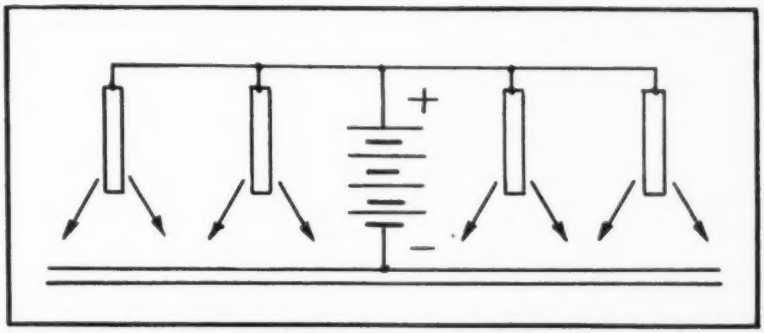
In tanks or similar structures carbon or other permanent-type anodes are immersed and connected to the positive pole of a rectifier or generator, the negative pole of which is grounded on the structure. In any case, the anodes must be spaced and their currents so adjusted as to provide uniform current density over the entire metal surface to be protected. In the case of elevated tanks this may require an auxiliary electrode extending into the standpipe. A current density 2 to 4 milli-amps per square inch is usually sufficient to prevent corrosion of iron in neutral waters. Where non-conducting protective coatings are used in addition to electrolytic protection much smaller total currents are required since the current density must be maintained only at breaks in the coating.

The galvanic potential existing between dissimilar metals is now being used extensively to give electrolytic protection, particularly where icing conditions might damage permanent

(Continued on page 55)



● ***CATHODIC PROTECTION of water storage tank shown diagrammatically. In actual practice several immersed anodes will be used.***



● ***BURIED ANODES electrically connected through current source to underground pipe are distributed to keep current density uniform.***

STREET AND HIGHWAY MAINTENANCE METHODS IN MICHIGAN

HOW DETROIT MODERNIZES ITS STREETS

G. R. THOMPSON
City Engineer

WITH an area of 140 square miles and a population of 1¾ million, Detroit's street mileage is 2,624, of which about 2,100 miles are paved; also, there are 1,621 miles of alleys, of which approximately one-third are paved. Of the 2,624 miles of streets 82 miles are State Highways and 115 miles are County Highways.

Thomas C. Hanson is Commissioner of Public Works. The duties of his office include all paving and repaving of streets and alleys and the direction and supervision of all work affecting them. The City Engineer is under the supervision of the Commissioner and has charge of, and performs, all engineering work for the department.

Street Maintenance

Detroit does not contract its street maintenance work, but maintains its 2,100 miles of paved streets by its Street Maintenance Division under Superintendent Jan Schmedding. The 82 miles of State Highways are maintained by the City with the State bearing 50% of the cost. The 115 miles of County Highways are maintained by Wayne County at no expense to the City. The Street Maintenance Division also keeps unpaved streets in passable condition. The budget for the current fiscal year for maintaining paved streets amounts to $1,675,275. This work falls into six principal categories as follows: (1) Resurfacing; (2) recapping; (3) surface treatment (Hot Plant Mix); (4) surface treatment (Sand Seal Coat); (5) cold patching; and (6) crack filling.

Resurfacing is the highest type of pavement restoration, and it is also the most costly; consequently, it is resorted to only on streets where the existing surface is so badly deteriorated that it is unsuited to sustain a recap; and also where the traffic volume is high enough to warrant a durable surface. In this class of work the old surface or both surface and binder, where necessary, are removed down to the old concrete base. The old base is cleaned of all loose and foreign materials, after which a 1½-inch binder course is laid and rolled. This is followed by a 2-inch, or better, surface course. The ingredients and method of mixing, placing and finishing of the surfacing are standard practice, details of which are available in our manuals and handbooks.

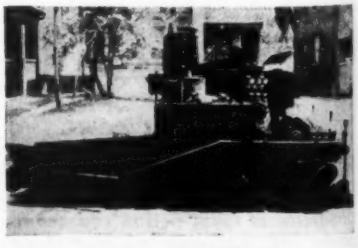
Recapping is specified where the existing surface is in fair condition, and is suitable as a base for the new surface. The work consists of a bond coat applied to the old surface and construction of a top thereon, of either sheet asphalt, or bituminous aggregate, approximately 2 inches thick. The materials in the recapping operation, as well as in the resurfacing previously mentioned, are plant mixed, and delivered and laid at a temperature of from 350° to 375° by means of mechanical finishing machines. Final compression of the surface is done with 10-ton to 15-ton tandem rollers.

Surface Treatment (Hot Plant Mix)—This is a sheet asphalt laid hot on the old asphalt surface by machine and rolled with a 15-ton tandem roller. After cleaning, leveling and applying a bond coat to the old surface, the new material is applied to a thickness of ½ inch. This surfacing is used on light traffic residential streets over old asphalt pavements.

Surface Treatment (Sand Seal Coat)—This is a form of treatment developed and used during wartime scarcities. It is employed primarily as a deferred maintenance operation, designed to waterproof and hold an aging surface together until such time as a more permanent treatment can be made. It consists of a single application of liquid asphalt at the rate of approximately ¼ gallon per square yard, by means of a pressure distributor. This bituminous application is followed by a cover coat of 25 pounds to 35 pounds per square yard of clean, dry, sharp sand previously coated with MC-2 cut-back (5% by weight), uniformly distributed by means of a mechanical spreader, and rolled with a 5-ton roller.

Emergency Repairs

Cold Patching is an emergency method of temporary repairs for the purpose of filling chuck-holes and minor pavement defects that develop at such times or during certain seasons when more permanent repairs may not be made. This treatment consists of cold application of a plant mixed oil-aggregate grading using MC-2 cut-back as a binder



Badly deteriorated streets are resurfaced when they can't be recapped if traffic warrants.

(8% by weight) and mineral aggregate, filled into and spread over broken areas of pavement and compacted by tamping. This method of temporary repairs is of such questionable value that it is to be discontinued as a general practice in favor of the application of asphalt cement and a hot plant mix, whenever conditions will permit.

Crack Filling and Joint Sealing—To prevent water from seeping in, and to retard spalling, cracks and joints are filled and sealed in the spring and fall of the year. Cracks are thoroughly cleaned by brooming or blowing out with compressed air. Asphalt cement heated to 300° is poured into the crack, level with the surface. To avoid tracking or smearing, dry, sharp sand is liberally applied from sand pouring cans. In filling joints, extruded expansion material is trimmed to slightly below the surface; if premoulded filler is inert and loose, it is removed. The joint is then poured and sanded as for crack filling.

Maintenance of Utility Cuts and Trenches

No cuts for utilities or other purposes are allowed in public streets or alleys except by permit from the Department of Public Works. The condition of this permit requires the advance deposit of money with the department in an amount sufficient to cover the estimated expense of repairing the cut and relaying the pavement. It is required that such work be done under uniform rules of the department, which are standard for the season from the first day of March to the first day of November. The rules provide for the maintenance of traffic, lights and barricades, temporary walks and crossings, proper bracing of excavations, backfilling, and replacement of base and surface, all according to specification and inspection by representatives of the City Engineer.

In general, cuts in asphalt or concrete pavements are temporarily surfaced in a safe manner by the permit holder and at a later date permanent repairs are made by the City at his expense.

Resurfacing of Street Railway Tracks

Upon the abandonment of some thirty miles of street railway lines, a study revealed that it would be more convenient to traffic and considerably cheaper to resurface over the rail area than to remove and salvage the rails.

After the track drainage inlets were plugged, the grooves in the rails were filled with sheet asphalt. A minimum of 1½ inches of binder was then laid by machine and rolled, after which a 1½-inch sheet asphalt surface was placed and rolled. On single tracks this surfacing was 18 feet wide and on double tracks 33 feet wide. Where the whole street was in poor condition, surfacing extended from curb to curb. By agreement the cost of this work was shared equally by the Department of Public Works and the Department of Street Railways.

Plants and Equipment

Detroit has two asphalt plants. The Western Asphalt Plant is located at 19th and Michigan Avenues. Originally built in 1905, the two units were replaced and modernized in 1936, Unit No. 1 with a two-ton mixer and Unit No. 2 with a one-ton mixer. The present capacity of the two units is 100 tons per hour on sheet asphalt mixture. At this plant, which employs 48 men, there is a laboratory for testing materials received and for the development of different types of asphalt mixes for various conditions. By means of laboratory control and large-scale operation the City is in an advantageous position to experiment and develop new and improved methods of handling street maintenance problems. This work is under the supervision of Charles Shattuck.

The Eastern Asphalt Plant is located on French Road north of Gratiot Avenue. Constructed in 1924 with two units, it was modernized in 1938 and the present capacity of the two units is 100 tons per hour on sheet asphalt mixture. Forty-one men are employed in this plant.

Fuller-Kinyon dust handling equipment is in use at both plants. Capacity is 300 tons at the Western plant and 450 tons at the Eastern plant.

Road equipment includes: 46 5-ton dump trucks; 6 asphalt mechanical finishing machines; 22 gasoline motor-driven tandem rollers; 5 distributors; 2 surface heaters; 3 chip spreaders; 1 stone spreader; 1 emulsion spray tank for applying bond coat; 5 portable two-wheel compressors; 12 fire pans for heating street tools; 7 asphalt kettles; 1 12-ton roller equipped with rotary cutting knife for trimming edges on long asphalt trenches and various quantities of asphalt rakes, tampers, smoothing irons, lutes, straight-edges, etc. All wooden and canvas sandals, lutes and straight-edges are made in City shops.

Costs

Latest cost figures available for maintenance work for the calendar year ending December 31, 1947 are as follow: 560,000 sq. yds. of resurfacing, average 2" thick, $1.12 per sq. yd.; 277,000 sq. yds. of hot plant mix, average 0.64" thick, 41c per sq. yd.; and 277,000 sq. yd. of sand seal coating, 0.25" thick, 13c per sq. yd. Plant costs on this material were: Sheet asphalt, $7.60 per ton; Hot plant mix, $7.18; Sand seal coating, $3.58; and cold patch material, $5.83.

Since January 1948 these plant costs have increased respectively to $9.60, $9.00, $4.53 and $6.92 per ton.

Highway Needs

Detroit has attempted increasingly to develop a method of determination of priority of need for maintenance

12-ton roller is equipped with rotary cutting knife to trim joints and edges of long asphalt trenches.

Spraying unit applies asphalt emulsion bond coat to streets before ½" sheet asphalt is laid.

Sand seal coat for waterproofing and deferred maintenance uses ¼ gal. of asphalt per sq. yd.

and improvement of its paved streets. For this purpose it has classified its highways as to traffic load and street conditions. Street widenings and improvements are correlated to a Master City Plan. For traffic purposes the highways are classified as follows:

(1) *Expressways*: These are main arteries with limted access, with opposing traffic separated, no intersections at grade and no traffic signals. Construction is now under way on nine miles of two expressways which amount of construction is expected to be completed about 1952.

(2) *Major Thoroughfares*: These are the heavy traffic carrying arteries of the City which carry four or six lanes of moving traffic with additional limited parking lanes. These thoroughfares are generally spaced one mile apart.

(3) *Secondary Thoroughfares* are those requiring widths of 40-44 feet for two moving lanes of traffic and two parking lanes. These primarily serve shopping areas, schools, commercial and industrial areas.

(4) *Residential Streets* make up the great majority of the street mileage. They are for the purpose of serving only the property abutting upon them and feed into the secondary or major thoroughfares. Non-local traffic on a residential street is a blight causing serious depreciation of property values and every attempt is made to divert this traffic to main thoroughfares by making them the line of least resistance for through traffic. In an old city such as Detroit where land use has changed greatly, the development of a modern highway system is necessarily one of slow but constant development.

During the last year the City made an inspection of the condition of its paved streets and from visual observations and traffic requirements classified them approximately into four priorities of need for improvement. This will serve as a general guide for the street program for the coming year and was the basis for budget requests for funds in the coming fiscal year ending June 30, 1950.

For dust control and ease of spreading, sand is coated with cut-back asphalt prior to application with spreader

New Street Construction

When new streets are dedicated the subdivider of the property clears and grades the surface and applies some road metal, such as 6″ of crushed stone, 20 feet wide. The City installs, at no cost to the property, necessary inlets and sewers for ditch drainage. Upon petition of 50% or more of the abutting frontage the City provides permanent paving on a local assessment benefit basis and absorbs the cost of the improvement within the boundaries of the intersecting streets. Because the Charter provides that a street assessment may be levied but once, only permanent type paving is installed by assessment. A corner lot is assessed for both front and side improvements on an equal footage basis. Alley paving may be assessed more than once.

All plans for paving are prepared by the City Engineer's Office under the direction of William J. Wallace, Highway Engineer.

New street construction in the calendar year of 1948 was practically all for residential streets and alleys. New paving construction is done by private contractors under an open competitive bidding system. In 1948, the City paved 54 miles of new streets and 1½ miles of alleys at a total cost of $3,950,000. This work was covered by 225 separate contracts. The average front-foot assessment for a 30-foot pavement was $6.25.

Detroit has adopted as standard, for light weight residential pavement, a one-course thickened edge 6″-8″ concrete slab with 7″ rolled integral curb, except at returns where vertical faced integral curb is used. Expansion joints are spaced a block, but not to exceed 400 feet, apart. Contraction joints or planes of weakness are spaced not to exceed 20 feet apart both longitudinally and transversely. Sub-base is not used under the slab but occasional bad pockets of soil are removed and backfilled with sandy material. Slab reinforcement is not used. Where heavy industrial traffic is anticipated, slab thickness is increased to 8″-10″. Alley pavements are 6″ uniform thickness. All concrete for street and alley paving is designed for 3500 lbs. in 28 days and usually runs to 4000 lbs. or higher. Air-entrained cement is required for all paving work.

Although all concrete mixing and placing is under close inspection, the work is core tested further to guarantee specific thickness and strength of concrete. All construction inspection is by the City Engineer's Office, under the direction of Floyd C. Morse, Engineer of Inspection and Tests.

As of the beginning of 1949 there are 359 petitions on file for new street and alley paving amounting to approximately 100 miles. It is anticipated that this work and further petitions to be received will result in an increased paving program for 1949. The City started to receive bids for this work about February 15, prior to the opening of the paving season, so that contractors could get commitments for materials and organize their work for the coming season. Bids are received twice a week in groups of about 12 streets at each bid opening.

County Roads STABILIZED WITH Asphalt

CLAUDE M. STOVER
Engineer and Superintendent
Oceana County, Mich.

UP TO this time, the cheapest construction that will stand up under primary road traffic in Oceana County is asphalt stabilization of gravel roads. Let me say at the outset, what is economical in this county may not be equally advantageous for another; but wherever local gravel deposits are few and far between, so that the average haul on gravel is from ten to fifteen miles, then I know the method I will describe below is an economical one.

Practically all of our gravel roads were built by the townships, with no thought of snow removal or needs of present day traffic. Consequently, the first problem is always to improve the grade, meanwhile salvaging as much of the old gravel as possible. This is an old story to old-timers; it is done in gently rolling terrain by blading all existing gravel to one side with a power grader. The ditches are then set back and the end haul carried out with a carry-all scraper or similar tool. Here, in Oceana

County, to facilitate snow removal, we construct the ditches the full width of the carry-all scraper, or about six feet wide, which, in many cases keeps the road passable in winter until the snow plows arrive.

When one side is completed, the gravel is bladed back on the completed portion and the same procedure repeated on the other side. The salvaged gravel is then bladed so as to cover the middle 20 feet, if that is the width of the finished metal desired, and a sufficient amount of new gravel is added to make the test a minimum of 30%. Already I can hear cries of protest because of the lack of stone, but our first job is now three years old, and shows no sign of wear. Remember I am talking at all times of light, sandy, or gravelly soils; I have never attempted any asphalt stabilization in clay soils.

Building the Surface

After the road-bed has been shaped and gravel testing 30% has been added, two gallons of asphalt per sq. yd. is applied in four equal increments. A distributor mounted on an ordinary truck will have difficulty applying the asphalt uniformly because of the truck's inability to maintain uniform speed in the loose gravel. Consequently, we have our South Bend distributor mounted on a Diamond T 6x6, and have experienced no difficulty whatever in applying the required amount of asphalt per square yard.

After each application of one-half gallon per square yard, the asphalt is mixed with the sand and gravel to a depth of 5 inches, with a Seamen Pulvi-mixer. The agitators on the mixer can be regulated to scarify to any depth desired and only one pass over the entire surface is necessary for each half-gallon "shot," until the entire amount of asphalt has been added.

While the asphalt is being added to the second mile the mixing of the first mile is accomplished as follows: The road-bed is split on the center line with a power grader and two windrows made of the mixture, care being taken not to blade deeper than 5 inches. The remainder of the mixing is done with an Adams re-tread paver, pulled, in our case, with a '48 Caterpillar D-7. If the grades of the road exceed 4%, it will be necessary at times to use two D-7 tractors or one D-8. When the bituminous mixture has attained a uniform color, and the stones are coated with the bitumen, the mixture is ready to lay out. This procedure outlined above will ordinarily take more than one day per mile, but one mile is the increment of length that generally will be most economical to use. Therefore, in order to facilitate traffic, both windrows are bladed to the center into one windrow. This also aids in mixing the bottom layer.

The following day, the windrow in the middle is split again with the retread paver, care being taken to divide the mixture as near 50-50 as possible, or the resultant mat will vary in thickness. After two rounds with the retread paver to place each windrow exactly on the quarter point, the mixture is laid out with the paver and then rolled thoroughly with a wobble-wheeled rubber-tired roller.

Finishing the Job

Because of the non-uniformity of gradation of the aggregate, a varying degree of compactness will result, which, of course, does not add to the riding qualities of the wearing surface. To overcome this undesirable feature, the entire wearing surface can be bladed with the power grader and then rolled again. These last two operations can be repeated as desired until the desired riding qualities are attained. Then, when this has been accomplished, the entire surface is rolled with a 5 to 8-ton steel wheel roller, to give the road-bed a smooth finish.

The next step is to "fog" the wearing surface with 0.2 gallon per sq. yd., keeping traffic off until the following day. Any spots having free asphalt still on the surface the following day can be lightly sanded and road opened to traffic.

Last winter and spring were among the hardest in Michigan on black-top roads; although we had a number of failures in our 2½-inch plant-mix laid the preceding summer, we did not have any failures in our asphalt stabilization jobs. In our case, the entire cost did not exceed the cost of a 6-inch compacted manufactured gravel base.

How Concrete Pavement Is Patched

PORTLAND cement concrete pavement surface maintenance as carried on by the Michigan State Highway Department, in the main, consists of skin patches, bituminous patches, cracked filling, joint filling, sealing, and mud jacking.

Skin patches are made by placing bituminous materials and cover aggregates on concrete surfaces that have distintegrated to a depth not greater than ⅜ inch. All loose or partially scaled concrete is removed from the area to be patched. After the area has been thoroughly cleaned a light cover of aggregate is applied. Then a coating of heated asphalt oil or tar is applied and before this oil chills more aggregate is added to a height a little above the pavement surface. The patch is then leveled and tamped, or rolled. Equipment needed for this type of work consists of trucks, tar heaters, rollers, tampers, hand tools and mobile flagging equipment.

Similar, but thicker, bituminous patches are used to correct pavement surface failures which are more than ⅜ inch and not over 3 inches deep. They are of two types, pre-mix patches and built-up patches. All loose and disintegrated pavement surfaces are removed from the area to be patched and edges of the failed area are chipped to form right angles by means of an air or gasoline driven hammer. The area is then thoroughly cleaned and, in the case of pre-mix patches, are filled with pre-mix material. Allowance is made for compaction. The material is tamped or in the cases of large patches, rolled to insure thorough and uniform compaction. The new surface is always finished slightly higher than the surrounding pavement to allow for ultimate compaction by traffic.

Built-up patches are made by applying liquid bituminous materials and aggregates on pavement surfaces

● ***DIAMOND-TOOTHED saw cuts concrete pavement in outline of section to be replaced.***

● ***AIR DRIVEN hammer then smashes pavement in patch area so that old concrete can be removed.***

● ***FRESHLY LAID concrete has been placed in outside lane. Old pavement is being removed from center.***

where failures exist. The point of failure is thoroughly cleaned and a laminated patch of bituminous materials and aggregate built up to a point above the pavement. Each layer of the aggregate is tamped to aid in keying the particles together. If the patch is a particularly large one, a roller is substituted for a tamper.

Trucks, tar heaters, pre-mix heaters, air or gasoline driven hammers, blow torches, rollers, tampers, small tools and mobile flagging equipment are generally used on large projects.

Crack filling with bituminous material serves two definite purposes: It prevents water from seeping into the base and it retards spalling. In general, crack-filling operations are carried on in the fall when the temperature is below 50 degrees. Efforts to fill cracks less than ¼ inch in width are seldom successful. Cracks are thoroughly cleaned by brooming or with compressed air. A bituminous material is heated and poured into the failure. To avoid tracking or smearing, dry sharp sand is liberally applied over the fresh bitumen.

Joint filling or sealing is usually done as late in the fall as practical, and when the temperature is below 50 degrees. Procedure for joint filling follows the same general routine as crack filling. In both cases, trucks, air compressors, tar heaters, hand tools, and often flagging equipment is used.

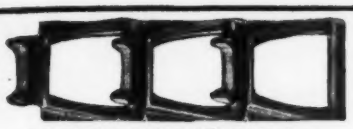
Mud jacking is an operation not too commonly used in Michigan; however when a short section of roadway is found to have settled, due to some subgrade or soil condition, a light grout is pumped under the highway, not only preventing further settlement but bringing the roadway up to proper elevation.

Trickling Filter Icing Control

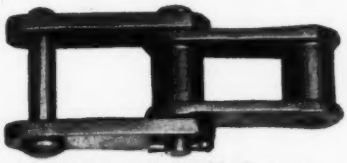
Sioux Falls, S. D., when it first put its trickling filter into operation, experienced considerable difficulty due to ice formation on the rock surface. Believing this was chiefly due to wind, Superintendent Bradnay constructed plank walls 9 ft. high entirely around the filter units, and this very effectively reduced the ice formation.

At Winner, S. D., Superintendent Madison found that serious icing occurred when, with temperatures only slightly below freezing, there was any appreciable amount of wind; but without wind there was no trouble, even with temperatures below zero.

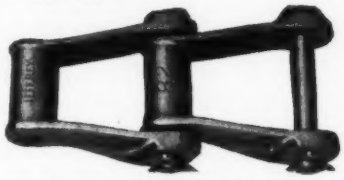
CHAINS, SPROCKETS and ATTACHMENTS



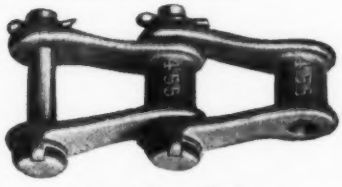
Detachable Link—Malleable Iron, SUPERMAL or PERDURO



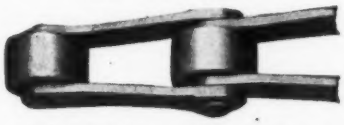
Combination—Malleable Iron or SUPERMAL Block Links and Steel side bars.



"H" Type Mill—Malleable Iron, SUPERMAL or PERDURO



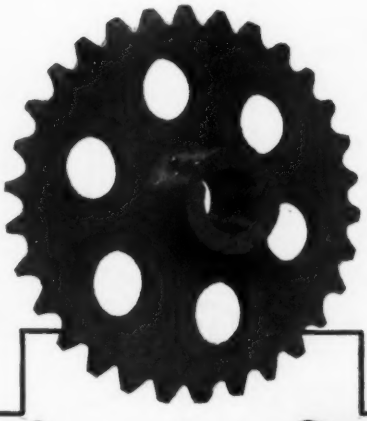
"400" Class Pintle



Malleable Roller—Malleable Iron, SUPERMAL or PERDURO

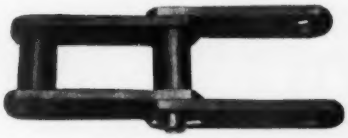
Steel Thimble Roller with straight or offset side bars

For every Elevating, Conveying and Driving need. Easy to select the right type and size from the broad Jeffrey line.



Long Pitch Steel Thimble Roller with plain or flanged rollers

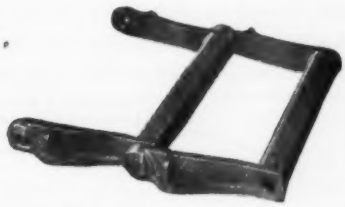
"800" Class Steel Bushed



Steel Knuckle

Transfer

Steel Block in various types



"H" Type Refuse—Malleable Iron or SUPERMAL

A-1

F-2

H-2

K-2

A-42 with C-wing

G-6

S-1

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Complete Line of Material Handling, Processing and Mining Equipment

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When you need special information—consult the READERS' SERVICE DEPT. *on pages 85-89*

Patching Pavements Better

(Continued from page 26)

a concrete mixer. The sand or screenings should contain not more than 7% passing the No. 200 sieve. The sand should be dry and the RC-2 should be added at a temperature between 120° and 140° F. The sand mix should have a bitumen content of from 5% to 6% (see Table I).

Patch material made from sand and cut back asphalt is excellent for smoothing rough places and taking out dips in surface treatments or old pavements. In this work the old surface should be given a paint coat of cut back asphalt (approximately 0.1 gallon per square yard), then the patch material should be spread over the area and raked smooth before rolling.

Sand and Stone Cold Mix

Sand and stone cold patch material should be used except in localities where local sand is available in sufficient quantities and at a cost low enough to make the "sand cold mix" materially cheaper. The "sand and stone" mix should be made with at least 50% sand. This amount of sand is necessary to fill the voids in the stone and to produce a waterproof patch. The "sand and stone" cold patch material can be mixed with a motor grader, a pug mill, any type traveling mixer, or a concrete mixer. When a concrete mixer is used, the procedure should be as follows: Place the stone in the mixer, add one-half of the RC-2, mix until all the stone is coated, then add the sand and the rest of the RC-2 and continue the mixing until the sand and stone are coated. The sand or screenings should contain not more than 7% passing the No. 200 sieve. When the cold patch mix is to be used on the surface or in patches less than 2 inches thick, the stone should be ¾" to No. 16. When made with 50% sand and 50% stone, the bitumen content should be from 4% to 5% (see Table I). The RC-2 should be heated to a temperature 120° and 140° F.

When deep patches are required or when the patch is used as a base, the mix should be made of 1½" to ¼" stone with at least 50% sand. The bitumen content in this mix should be from 3% to 4% (see Table I).

"Cold patch" mixes should be allowed to cure several days before being used. They are soft and will push under traffic if used immediately after being mixed. This is especially true of sand cold patch material.

Table I shows the gallons of cut back asphalt (RC-2) to be used to obtain the desired bitumen content in cold patch mixes. Aggregates and asphalt should be measured as accurately as practical to insure proper proportions.

RC-2 Cut Back Asphalt may be considered as 80 per cent bitumen and 20 per cent solvent by weight and weighing 8.00 pounds per gallon.

TABLE I—RC-2 PER TON OF MATERIAL

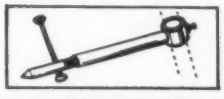
Approx. Bitumen Content—%	Gallons RC-2 Per Ton
3	9.5
4	13.0
5	16.5
6	20.0

Skin Patches

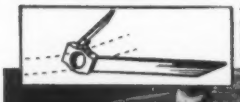
Sealing cracks in bituminous surface treatment. All cracks in the surface must be kept sealed. This should be done by painting the cracked area with cut back RC-2 asphalt heated to 125° F. The asphalt should be broomed out thin, using just enough to seal the cracks, and should be covered with sand or stone screenings.

NEW—"FLEXIBLE" LOWER MANHOLE JACKS SAVE TIME AND WORK AND EQUIPMENT

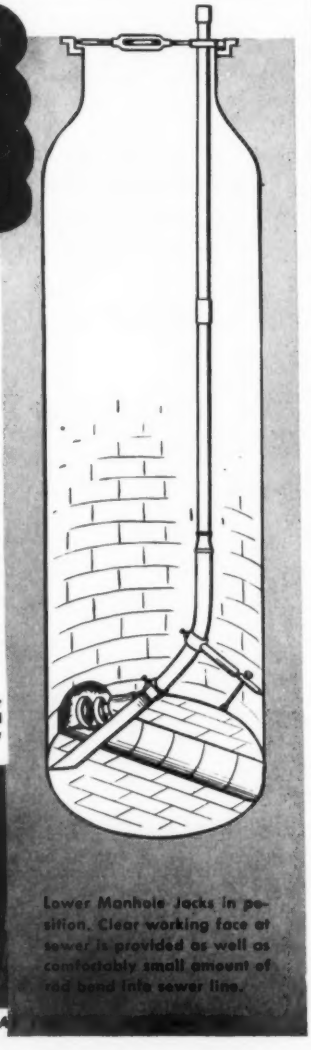
"FLEXIBLE" experience again provides new methods of simplifying tough jobs. These two new Lower Manhole Jacks brings sewer and line cleaning operations another step further into the open. They also speed tool changing. Note how the coupled rod guide is quickly, firmly, simply anchored at the bottom of the manhole. Also note that the face of the bell is held away from the lip of the sewer line itself. This enables operators to see roots before they jam tight in the rod guide.



Adjustable Back Jack (Optional use). Perfect for getting additional anchorage of rod guide. Sold separately.



Adjustable Foot Jack. Ideal for use with proven "Flexible" Steel Rod system of cleaning sewer lines. Sold separately.



Lower Manhole Jacks in position. Clear working face of sewer is provided as well as comfortably small amount of rod bend into sewer line.

ASK YOUR NEAREST "FLEXIBLE" OFFICE TODA

FLEXIBLE SEWER-ROD EQUIPMENT CO.

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When you need special information—consult the READERS' SERVICE DEPT. on pages 85-89

PUSH-PULL for POWER PLUS Bucket-Loads

Hydraulically controlled bucket is shown above at load start position. Double action cylinders are placed in power plus horizontal thrust position. Note powerful triangular construction.

Hydraulic Bucket control permits slow or fast dumping. Loaded bucket can be leveled throughout lifting operation. Start of controlled dump is shown in illustration above.

THE OTTAWA DOUBLE ACTION INDUSTRIAL LOADER

Dual Hydraulic operation throughout. The bucket is hydraulically controlled by a powerful pair of double action cylinders. This feature adds many operational uses never before found in loaders of its price range.

High capacity double action lift cylinders make the Ottawa "Double Action" outstanding in the loader field. Down pressure on lifting cylinders adds excavating to the long list of material handling operations possible with the New Ottawa. Here is a loader that lifts, loads, digs and builds stock piles as well as functioning as a material leveler and spreader.

Now available for following tractors:

Minneapolis Moline RTI—UTI—UTIL
International Harvester I-4—I-6—ID6—I-9—ID9
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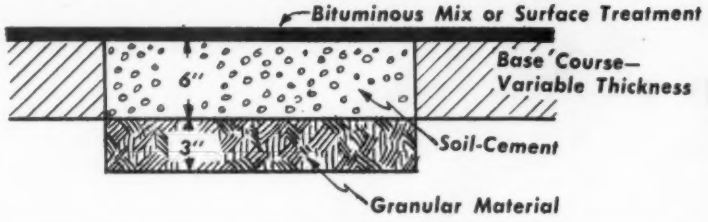
It's new—It's a feature your customers have been looking for—It's low cost—It's economical — Write today for complete details and price list.

The Ottawa INDUSTRIAL HYDRAULIC FRONT END LOADER

Ottawa STEEL PRODUCTS, Inc.
INDUSTRIAL DIVISION
OTTAWA, KANSAS • U. S. A.

When you need special information—consult the READERS' SERVICE DEPT. on pages 85-89

FIG. 6. USING SOIL-CEMENT AS BASE COURSE



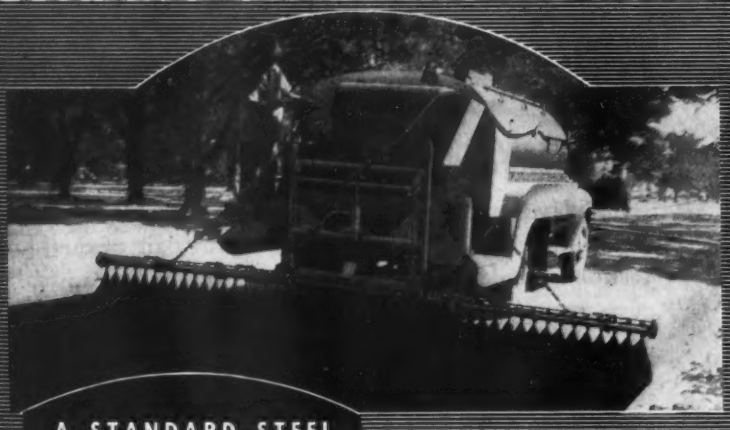
Patching Scaled Pavements: (1) Where the depth of the scale is ½" or less, the scaled area should be thoroughly cleaned and adjacent loose scale removed. The area to be patched should be given an application of approximately ¼ gallon per square yard of RC-2, and covered with ¾" to No. 16 aggregate. The patch should be rolled or tamped. (2) Where the depth of the scale is greater than ½", the area to be patched should be painted with RC-2 and the patch made with the cold patch mix materials referred to above, or with hot plant-mix material when available.

Essential Points

A job worth doing is worth doing well. A good patch on a good base will not require additional attention.

Always erect standard warning signs when patching. Mark unfinished patches with signs and red flags during daylight hours and with signs and lighted flares between sunset and sunrise. Remember that RC-2 is inflammable and should be handled with care. Keep fire away from RC-2.

NO TIME LOST!
LOADING OR LAYING ITS LOAD



A STANDARD STEEL PRESSURE DISTRIBUTOR GIVES EQUAL CIRCULATION THROUGHOUT THE SPRAY BAR FOR A UNIFORM SURFACE FROM CURB TO CURB FOR LONGER WEAR

STANDARD STEEL
PRESSURE DISTRIBUTOR

The Model 424 can be loaded in quick time for a "fast getaway". A two-way cleaning system guarantees a clean spray bar at the end of the day. First, the material is sucked out of the bar and back into the tank. Then by turning one small valve, cleaning solvent is released into pump and spray bar (without contaminating the asphalt in the tank). No time lost in tinkering — no time lost in loading — Standard Steel 424 keeps going all day long far ahead of the "gravel gang"

WRITE FOR CATALOG 424

OTHER PRODUCTS OF STANDARD STEEL

Maintenance Distributors, Tar Kettles, Patch Rollers, Supply Tanks, Tool Heaters, Asphalt Tools, Street Flushers, Construction Brooms.

Built to the Highest Standard

PD-1

Standard Steel Works NORTH KANSAS CITY, MO.

When you need special information—consult the READERS' SERVICE DEPT. *on pages 85-89*

Refuse Disposal in Texas

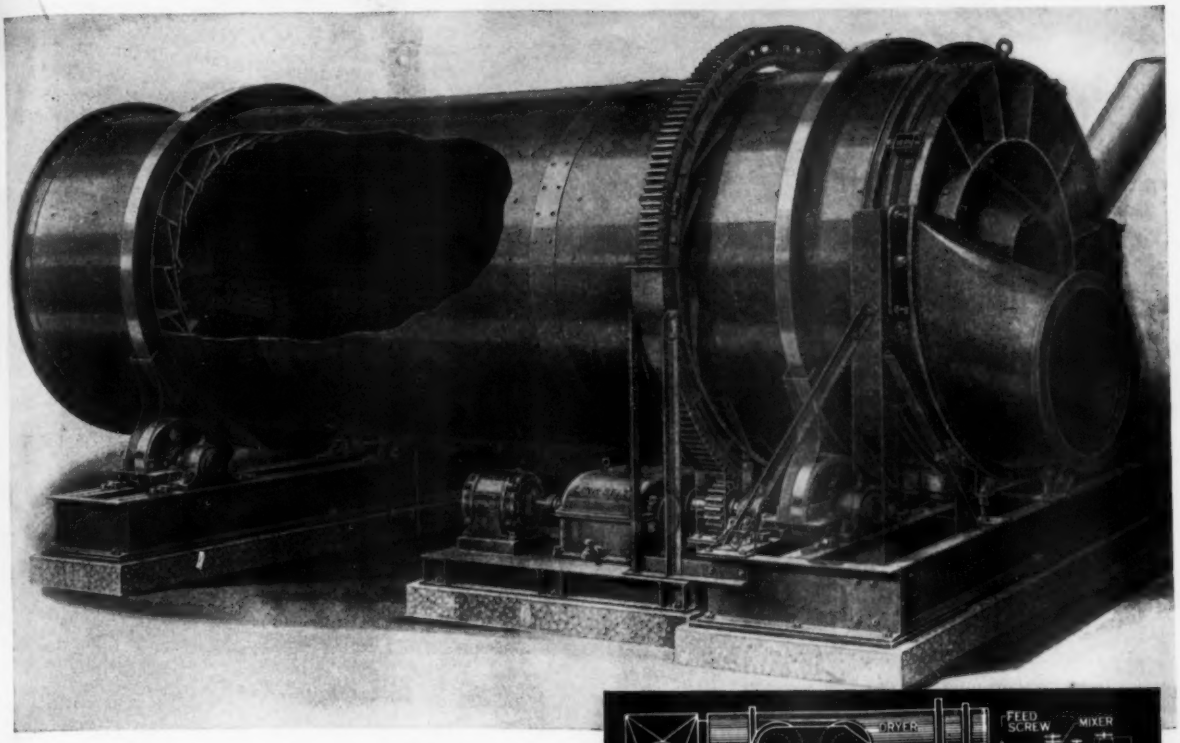
The League of Texas Municipalities has collected data from 40 cities of the state relative to refuse collection and disposal, the cities ranging in population, 1940 Census, from 87,930 (Austin) to 1,851 (Livingston). These show a number of interesting features, and both uniformities and wide differences in practice.

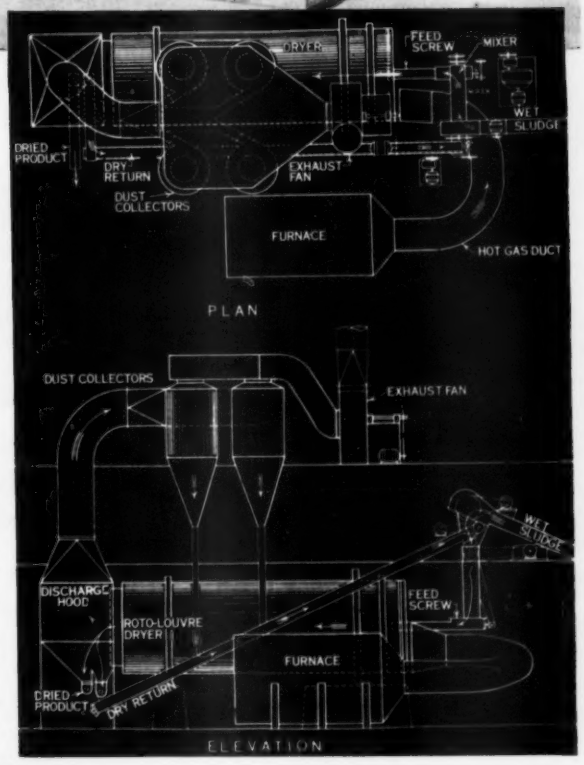
In the matter of trucks used, we note that 17 of the cities used the comparatively recent packer type of trucks; most of them have exceeding 9,000 population, although 4 are smaller than 7,000. The number of men per truck is 3 in 19 cities, 2 in 7 cities, 4 in 4 cities, and only 1 in one city; with both 2 and 3 reported by 3 cities, and 2 and 4 by 2 cities, and 3 and 4 by 2 cities.

The number of collections per week from residences is 2 in 23 cities, 1 in 14 cities, 3 in one city and 1½ in one. (No difference by seasons is reported.) In every city, collections in the business district are more frequent than in the residential. In 26 cities, 6 collections per week are made; in 7 cities, 7 collections; 5 collections in 2 cities; 2 or 3 in 3 cities; 2 daily in one; and in one city collections are made by private parties.

For disposing of garbage, 24 deposit it on dump grounds, and 12 others report sanitary fill. Four have incinerators, one of them with only 6,410 population, the other three having 10,000 or more.

Charges are made for the garbage service by 26 cities, ranging from 33 cts. per capita per year to $4.00. In 22 cities the bills are combined with those of the water department, and in 5 cities the water is cut off if the refuse collection bill is not paid.





May we demonstrate LINK-BELT Roto-Louvre Dryer Performance on Sludge?

The Link-Belt Roto-Louvre Dryer is ideally suited for drying sewage sludge or solids from industrial wastes. Operating upon the principle of convected heat, it offers more efficiency, more uniformity of product, no overheating or scorching of material. It can handle a large volume in a small space.

The Roto-Louvre Dryer *percolates* hot air through the material — its unique design eliminates cascading of material into an air stream. It reduces degradaton, dust and loss of material through the exhaust.

May we demonstrate to you the performance of the Roto-Louvre Dryer? The Link-Belt Dryer Laboratory is available for test runs to show you exactly what you can do in your own plant. Contact your nearest Link-Belt office to arrange for a test run.

We manufacture a complete line of water, sewage and industrial liquid treatment equipment, such as coarse and fine screens, grit and sludge collectors for grit chambers and settling tanks, scum breakers for sludge digestion, and sludge handling equipment. Send for catalogs.

LINK-BELT

THE SYMBOL OF QUALITY — LB — LINK-BELT

DRYERS AND COOLERS
DRYING PROCESS ENGINEERING

LINK-BELT COMPANY

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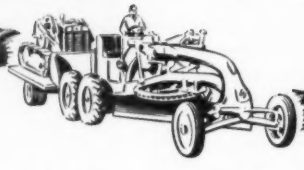
HD-5 TRACTOR

HD-5 TRACTOR with Tracto-Shovel and its interchangeable attachments—1 cu. yd. standard bucket, ¾ cu. yd. narrow bucket, 2 cu. yd. snow loader bucket, 1 cu. yd. rock bucket, bucket teeth, heavy-duty bulldozer blades, V-type snowplow.

Wrap up

YOUR YEAR 'ROUND PROBLEMS *with this*

EQUIPMENT PACKAGE



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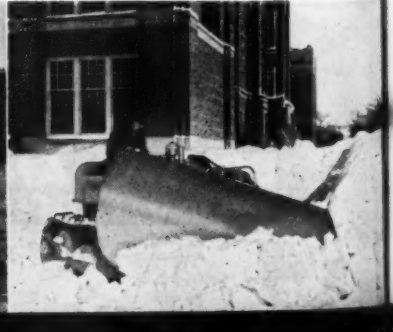

BD-3 MOTOR GRAD

BD-3 MOTOR GRADER, 78 brake h
19,042 lbs. . . . or any other A-C die
powered model—AD-4, 104 brake h
22,140 lbs.; AD-3, 78 brake h.p., 21,8
lbs.; BD-2, 50.5 brake h.p., 17,772 lbs.

SOME OF THE JOBS YOU CAN DO WITH JUST THESE TWO MACHINES

- Clean and shape-up ditches
- Cut and smooth backslopes
- Handle regular maintenance
- Widen and reshape roads
- Make driveways and bridge approaches
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- Backfill pipe, culverts, bridges
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- Load surplus dirt from shoulders and ditches
- Remove and load topsoil
- Make fills
- Handle bulldozing
- Make channel changes
- Plow, move and load snow from roads and streets, alleys, parking lots, cemeteries, institutions
- Skid trees
- Load rocks and stumps
- Dig and load dirt
- Load sand, gravel and other material
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- Do crane work
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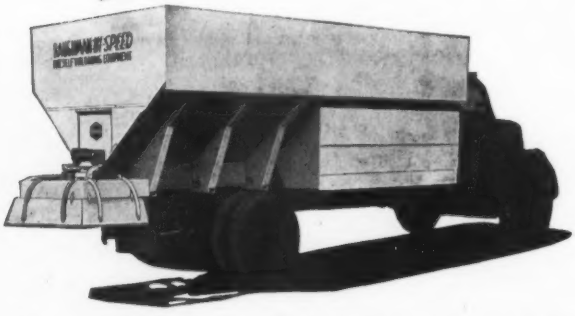
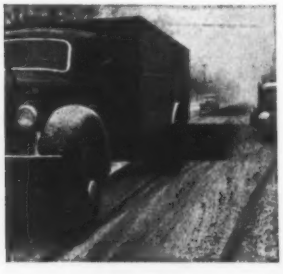
INSURANCE AGAINST DEATH!



Save Lives! Skid-Proof with The BAUGHMAN Spreader

You give your citizens quick effective insurance against dangerous driving conditions when you use the BAUGHMAN Spreader.

FAST ACTION! Spreads 8 to 30 ft. widths at speeds up to 25 mph. *ALL-WEATHER OPERATION* — built-in exhaust heater prevents freezing of conveyor chain and material . . . keeps material in working condition. *CUTS COSTS*—self-unloading, it's operated by one man.



CAB CONTROL!
Vacuum clutch control in cab starts and stops drag chain and spinner. Prevents waste . . . skid-proofs hills and curves to desired lengths . . . spot-spreads at junctions — ALL ONE-MAN CONTROL!

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CITY-COUNTY *Public Works* ENGINEERING DATA

Bid Prices for Laying 10 and 12-Inch Cast Iron Pipe

Bids were received by Fond-du-Lac, Wisc., on Feb. 15, for water works improvements, including 2,000 ft. of 12-inch pipe and 2,023 ft. of 10-inch pipe, all cast iron; also a valve manhole; and for connecting the 12-inch main to the 10-inch. The low bidder's prices were: valve manhole, $1844; 12-inch pipe, $9.00 per ft.; connection to 10-inch, $600; 10-inch pipe, $7.20 per ft. Next bidder's prices were, for corresponding items: $2,000; $8.75; $500; and $7.25. Totals on this item of work for the three low bidders were: $36,610; $37,066; and $38,617. Bids on pile bents, not included in this tabulation, varied from $2.50 to $4.25 per ft. The engineer's estimate for the total work was $43,500.

Other prices were, for low and second low bids: dry excavation, $1.00 per yd. each; wet excavation, $1.50 per yd. each; gravel and sand backfill, $2.00 per yd. each; floor concrete, $14.00 and $19.70 per yd.; formed concrete walls, $30.00 and $31.20 per yd.; formed concrete slab beams, $45.00 each for the two low bidders; and timber sheeting, $90.00 and $140.00 per MFBM. There were five bidders, and the above bids are the two lowest under each item. Low bidder's total was $14,600; second bidder, $17,178; engineer's estimate, $19,500.

Cost Breakdown of Recent Bids for Sewer Construction

Bids were received by the city of Bristol, Conn., on Feb. 24, for the construction of sewers. Metcalf & Eddy, Boston, were consulting engineers. Certain of the bid prices are as follows: Earth excavation and refill, by machine, 14,000 cy., low bid, $1.25; other bids, $2.00, $2.05, $3.00, and up to $8.00.

Furnishing and laying 8-inch standard sewer pipe, 2,800 ft., low bid, $1.60; other bids, $1.75, $1.85, $2.00 and $3.00. Furnishing and laying 10-inch standard sewer pipe, 620 ft., low bid, $1.95; other bids, $2.00, $2.25, $3.50 and $3.90. Furnishing and laying 12-inch standard sewer pipe, two bids at $2.85; other bids, $3.00, $4.50, $5.00 and $7.50. For 15-inch pipe, furnishing and laying, 6,230 ft., $3.00, $3.70, $4.15 and up to $12.00.

For furnishing and laying 4,685 ft. of 14-in. cast iron pipe, low bid was $6.50; other bids were $7.00, $7.75, $8.00 and $9.00.

When you need special information—consult the READERS' SERVICE DEPT. on pages 85-89

Why Digester Gas in Winnipeg Is Wasted

The Greater Winnipeg (Manitoba) Sanitary District has for ten years been operating a sewage treatment plant which includes sedimentation and sludge digestion in heated tanks, elutriation and vacuum filtration. Secondary treatment is not considered necessary. In a paper before the Canadian Institute on Sewage and Sanitation, W. M. Scott, chairman, and J. A. MacGillivray, engineer of the District, described, among other operating experiences, those connected with gas production and utilization. This part of their paper was as follows:

The average quantity of digester gas produced has been about 1 cu. ft. per day per capita contributing population. Approximately 20 per cent of the gas produced was utilized in heating the digesters and treatment works buildings, the remainder being wasted.

To waste 183,000 cu. ft. of gas per day seems an economic sin. In the plant design provision was made for gas engines to use the surplus gas to develop electric power. The fact that the Hydro Electric Department of the city of Winnipeg offered a power rate of 0.625 cents per kw.-hr. caused the Administration Board to accept this quotation and defer installation of gas engines perhaps indefinitely. This decision has been supported by later experience showing that there is a three-week period in the spring when the sewage is so dilute that barely enough gas is produced for heating requirements. During this period the engines would have to be converted to use of fuel oil, if gas was used for power purposes. This factor places the balance in favor of the present arrangement for power.

Many proposals for the use of this wasted gas have been made, but none yet adopted. The latest proposed the use of waste gas in the firing ovens of a new brick and tile manufacturing plant located about a quarter of a mile from the sewage plant.

Average content of the gas has been as follows:

Methane (CH_4)	66.9%
Carbon dioxide (CO_2)	32.3%
Other	0.8%
B.t.u. per cu. ft.	635

Average Hourly Wages, First Quarter of 1949

The Public Roads Administration reports average hourly wage rates on Federal-Aid projects for the first quarter of 1949, as follows: Executive, administrative and supervisory, lowest, $1.50 in East South Central; highest, $2.32 in Pacific; average, $1.80. Skilled labor, lowest, $1.53 in South Atlantic; highest in Middle Atlantic, $2.41. Intermediate grade labor, lowest in East South Central, $0.94; highest in Middle Atlantic, $1.78. Unskilled labor, lowest in East South Central, $0.75; highest in Middle Atlantic and Pacific, $1.58. National averages for the four categories are $1.80, $1.82, $1.28 and $1.00.

Speaking Traffic Signals in England

A demonstration was given recently in England by the makers of a speaking traffic signal. By means of a compact reproducer attached to the traffic signal post, a typical message such as "Before crossing, look right, look left, look right again," is recorded on a short continuous length of magnetic tape and the reproducer is synchronized with the changing of the lights so that the message is given at the appropriate

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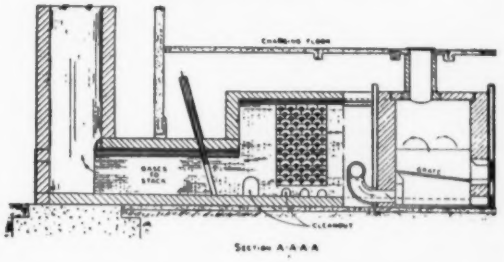

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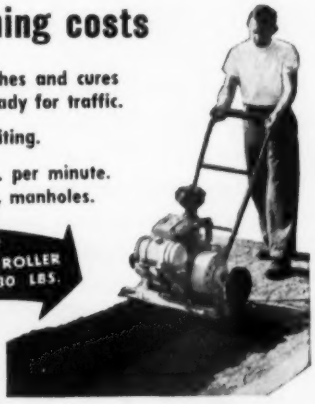

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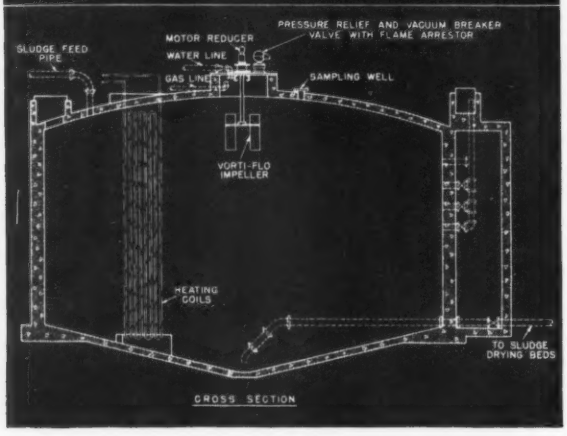

Cross sectional elevation of Infilco's VC Digester

WITH INFILCO'S **VC DIGESTER**

ELIMINATE the difficulties resulting from excessive scum formation. Get all the benefits of proper mixing, circulation and temperature control. The Vorti-Flo impeller in Infilco's VC Digester sets up a *controlled disturbance* in the upper part of the tank to prevent excessive scum formation. It also provides the agitation and mixing necessary for optimum digestion. Call or write your nearest Infilco Field Engineer or Chicago Headquarters for complete information.

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SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES
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moment. The magnetic tape consists of a plastic core coated with iron oxide and as the message is reproduced magnetically it is claimed that there is practically no wear to be taken into account.

Uses Soil-Cement for Aggregate Stock Pile Base

To have a suitable area for a stockpile for a concrete paving job in Crawford Co., Pa., the contractor, J. F. Bloomer Co. of Appleton, Wisc., decided to use soil-cement. The area selected for the stockpile was an old dump. This was graded; a satistactory soil was located; and a soil-cement base constructed in 8-ft. lanes, using 8% of cement, with an additional 4% in the upper couple of inches. An area of 3,100 sq. ft. was paved.

Fluorescent Lighting for Highways and Bridges

An experimental fluorescent lighting installation has been made at Salem, Mass., by engineers of the Sylvania Electric Products, Inc. The installation consists of a row of 8-ft. slimline fluorescent lights mounted 5 ft. above the roadway on a fence rail along one side of the bridge. Specular reflectors throw the light across the 32-ft. roadway to illuminate the sidewalk and curb, and it is unnecessary for motorists to use headlights. This use of a continuous line of lights eliminates glare and appears to be satisfactory.

Dehumidifying the Air in a Water Works Plant

On February 3, 1949, an air dehumidifying unit was placed in operation in the west pump room of Chicago's South District Filtration Plant. Of this, H. H. Gerstein, Chief Filtration Chemist, says: City Engineer W. W. DeBerard and Assistant City Engineer Fred Gordon arranged for this installation, which involves a most interesting and important experiment in the elimination of a profuse water condensation condition on the walls, piping and equipment in the filter piping galleries. Previously condensation had caused serious corrosion of the filter control equipment, piping and valves, as well as creating uncomfortable working conditions for the employees.

The Kathabar packaged dehumidifying unit is of 5000 cu. ft. per min. capacity and is installed in the west pump room to act as a pilot plant to study the effectiveness of removal of moisture from the air and to solve some of the water condensation problems in the plant. After data are obtained from the operation of the pilot plant, the efficiency and economics of this method for elimination of corrosion and correction of other operating problems due to water condensation will be studied, and a decision will be made regarding the desirability of providing such installations for the filter pipe galleries.

As far as we know, this is the first installation in the United States where air dehumidifying is being tried for the purpose of elimination of water condensation in a water works plant. It is reported that a similar experimental installation was made in Germany. It was destroyed by aerial bombing during World War II, and no record of its effectiveness is available. The American air-conditioning industry is watching this experiment with much interest. If successful, it will probably open up new uses for air-conditioning equipment.

When you need special information—consult the **READERS' SERVICE DEPT.** *on pages 85-89*

"But what ails Henry, Doctor?"

MAJOR credit for the virtual wiping-out of the typhoid fever scourge of 50 years ago is due to the growth and progress of public water works systems. In 1899, when our Company was established, there were about 3,000 public water works systems in America. Today, 12,000 water works furnish 85 million people with eight billion gallons of water per day, 90 per cent of which requires and receives treatment to make it safe.

The gas industry and sanitation have also made notable contributions to better health and living in the past 50 years. Today, over 20 million families use gas for cooking, refrigeration, or home heating. More than half of our urban population is now served by 6,000 sewage treatment plants.

As the largest producer of cast iron pressure pipe for water, gas and sewerage service, we too can look back on a half-century of progress in manufacturing methods, production standards, quality controls and facilities for research and development. The service records of our early product are truly remarkable, yet U. S. Cast Iron Pipe as we make it today is demonstrably superior—in strength, in toughness and in uniformity.

To those responsible for the great progress in water supply, gas and sanitation service and their contribution to better health and living over the past fifty years, America pays tribute.

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Sludge Drying
WITH ROTO-LOUVRE DRYER

MORTON GOLDSTEIN
Engineer, Link-Belt Company, New York

MOISTURE can be removed from sewage sludge in several ways, or by a combination of various methods. The first step in moisture removal is usually a mechanical step such as settling, screening, centrifuging, pressing, or filtration. It is, as a rule, most economical to take out as much water as possible by these mechanical means before applying heat for evaporation. In treatment of sewage sludge, a vacuum filter is usually used for this mechanical dewatering process, and the moisture content of the sludge may be reduced to 75% to 85%. This figure will vary at different plants due to the type of sludge and its treatment, as well as to the equipment used for dewatering.

In heat drying, a heat transfer is necessary. This heat transfer may be accomplished by one or more of three ways—conduction, radiation or convection.

When heat is transferred by a molecular motion through a substance, it is transferred by conduction. A steam tube dryer, the center tube of a double shell dryer, or a single shell dryer heated on the outside operates on this principle. The material is dried by having it cascade on the hot surface, and the transfer is by conduction.

Heat is transferred by radiation when radiant energy passes through air or other intervening media (which are transparent to the radiations), to an arresting body which is opaque, and absorbs these waves. In the dryers mentioned above, some of the heat is transferred in this way; infra red lamps operate solely on this principle.

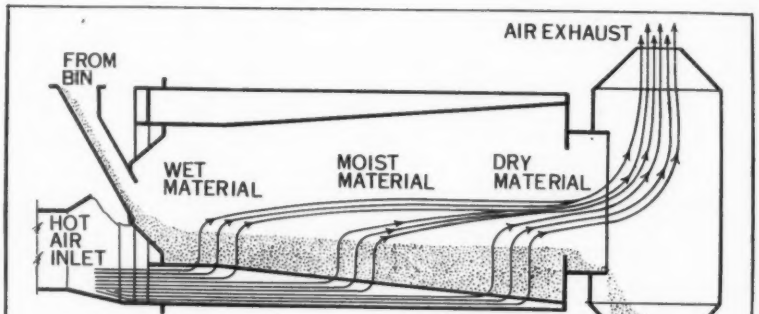
The third method of heat transfer, convection, is accomplished when heated molecules move in currents of heated fluid, carrying thermal energy from one medium to another.

Heat drying of sewage sludge, which is best done by convection, is accomplished in one of three types of equipment, the flash dryer, the rotary air dryer, and the spray dryer. The Roto-Louvre Dryer is a rotary air dryer application of the principle of convected heat, in which efficiency, uniformity of product, minimum dusting, no overheating of material, and small space requirements have been considered and provided for in the design.

This equipment, originating in Sweden and England, and manufactured and developed in the United States for the past 12 years by the Link-Belt Company, departs from the usual method of cascading the material through the heated air stream. To outward appearances it appears to be a conventional rotary shell dryer; however, there are internal innovations in construction which insure most effective heat utilization.

The internal construction of the Roto-Louvre Dryer is shown in Fig. 1. The drum is made with an outer shell, from the inner circumference of which full length plates, tapering in width, project radially. To these radial plates, or louvres, are attached full length tangential plates which overlap, forming a circular inner shell with a tapering cross section on which the material rests during its progress through the dryer. Thus, the space between the inner and outer shells is partitioned into individual chambers, and it is through these chambers that the heated air passes into the material bed.

The air, entering these chambers at the feed end of the dryer, is contained in the chambers under the bed of material by means of a manifold inlet valve, located on the stationary end plate in one of the lower quadrants of the circle. The tapering of the louvres serves two purposes—(1) to convey the material forward when the drum is rotating; and (2) to maintain automatically a uniform velocity of gases entering the dryer, regardless of the distance from the feed end. The dryer is mounted horizontally, permitting good mechanical performance and low maintenance.



● ***FIG. 2. How heated air passes up through the bed of material being dried.***

The sludge being dried flows inside the dryer, and is lifted by the rotating drum only until it reaches its angle of repose, then flowing down over itself. Because of this, there is no sliding of material on steel louvres, and therefore, no wear. Also, since the material flows on itself, rather than being picked up by lifters and dropped into an air stream, degradation of material is kept to a minimum. This creates less dust, and maintains the particle size of the material. Also, since air is passed slowly up through the bed of material, rather than the material being cascaded through the air stream, less material is carried out by the exhaust air stream.

The heated air passes up through the louvres of the dryer and percolates through the material bed, as shown in Fig. 2. Due to the construction of the inlet air manifold, there

is no bypass of air, and, therefore, all of the heat entering the dryer is utilized in the evaporation of moisture, and little is left to be added to the sensible heat of the material. Case-hardening is prevented, even though high temperatures are used, because the heated air entering the bed loses its heat before leaving the bed. Therefore, while a particle at the bottom of bed is treated with hot, dry air, the same particle, in one quarter of a revolution of the dryer, will be in near the top of the bed where in contact with cooler air of higher humidity. This process takes place constantly, with particles contacting air at various temperatures and humidities.

The gases, after making one pass through the dryer, are exhausted through the discharge end nozzle of the dryer into a discharge hood. The material also discharges through this nozzle into the hood. The nozzle is designed to allow the material to build up in dryer to give a fairly heavy cross section.

The air stream is exhausted from the discharge hood by a dust collecting system and an exhaust fan. The discharge hood, which also acts as a primary dust settling chamber, is kept under a slight suction. Changes in design of the Roto-Louvre Dryer allow the use of one fan and at the same time permit perfect control to be maintained over drying.

The Roto-Louvre drying system lends itself admirably to automatic control. It has been found that the moisture content can be controlled in any particular material, in its passage through the dryer, without waiting for it to come out of the dryer wet. The dryer can be operated at either a fixed inlet air temperature, or the furnace can be controlled from the exhaust temperature, using a high temperature limit. The volume of gases can be controlled in proportion to the required amount of drying to be done. Thus the variations in the drying operation are held to a minimum.

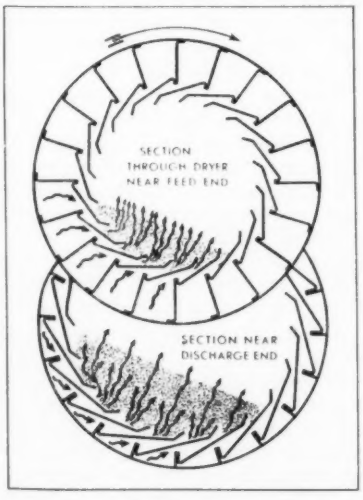


Fig. 1. Internal construction of Roto-Louvre dryer.

Link-Belt Company has, from the start of its drying experience, maintained a laboratory and pilot plant at its Chicago factory. This complete test plant has been available to its customers, and considerable work on sewage sludge drying has been done on both raw activated and digested sludges. The Milwaukee Sewerage Commission had been drying activated sludge since 1925. Their plant consisted of nine direct-indirect rotary dryers, 84″ in diameter x 60 ft. long, encased in brick. The Commission investigated the Roto-Louvre Dryer, and in 1941 purchased it as an additional unit. This dryer has been in operation for about seven years. It is 11 ft. 6 ins. in diameter by 35 ft. long, driven through a herringbone gear reducer by a 15 hp. motor. It has a capacity of 2000 lbs. per hour of sewage sludge (discharge containing 5% moisture), with a total evaporation of water of 9875 lbs. per hour. Thus, the feed

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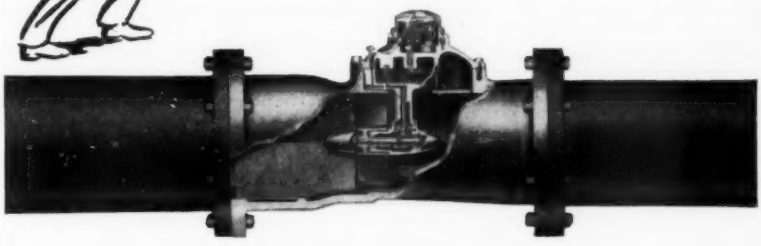

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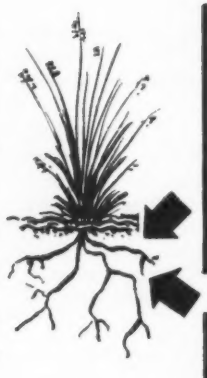

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The C. B. DOLGE CO.
WESTPORT, CONNECTICUT

When you need special information—consult the* READERS' SERVICE DEPT. *on pages 85-89

to the dryer would be 11,875 lbs. per hour of sewage sludge containing 84% moisture. The practice at this plant has been developed over a period of years as the best way to handle a material of this kind with a high moisture content. There is a natural tendency for this material to form large balls unless a portion of the dried material is mixed back to break it up. Therefore, it is necessary to recirculate part of the dried material, mixing it with the wet material in a paddle mixer, so that the actual feed moisture to the dryer is considerably reduced. This conditioning feeds the dryer with sludge that is easy to handle, dries uniformly, and has good particle size. In order to obtain this feed, it was necessary to recirculate more dried product per hour than is actually sent to storage.

The air in this unit is heated in an oil-fired furnace to 750° F. In this installation, the furnace is under suction; there being no inlet fan, the gases are pulled through by the exhaust fan. The exhaust gases pass through two Link-Belt cyclone dust collectors 9 ft. in diameter, the collectors being located between the dryer and exhaust fan. The air from the cyclone then passes to the common stack used on all the dryers at Milwaukee.

The sludge from the Oliver filters is conveyed from the filter room to dryer room by a 36″ wide rubber-covered flat belt conveyor. At each dryer a plow diverts the proper portion of wet sludge to a paddle mixer. Dry material from the discharge hood of the dryer is brought to a cross screw conveyor that discharges into the feed end of the paddle mixer at the same point as the wet feed is introduced. The design of this mixer was an important part of the drying system, since it is imperative to obtain a thoroughly mixed product before it passes into the dryer.

The product is discharged from the dryer at approxmately 160°. This is the maximum temperature of the material, and is reached only at the extreme end of the drying cycle. Since uniform drying takes place, burning, which would result in objectionable odors, does not occur. There are no objectionable odors from this drying operation.

Due to the fact that all the dryers at Milwaukee are tied together in one system, it has been difficult to obtain any data on thermal efficiencies. However, definite guarantees as to performance can be made when all conditions of use are known.

In consideration of fuels, the BTU content is often given as the total or high BTU content. In calculating

efficiencies, consideration has been given to the heat lost in the generation of water due to the hydrogen in the fuel. This water goes up the stack as water vapor, unless the exhaust air is cooled down to the initial temperature of fuel, taking off latent and sensible heat that has not been reclaimed. In the case of sewage gas this amounts to approximately 10% loss while for oil it averages 4%. If, in figuring efficiencies, the low heat value of the fuel is used, then, of course, this factor has been taken care of in calculating the BTU value of fuel.

Where a market is available for dry sewage sludge, drying is an efficient method of disposal of the sludge. When sludge is incinerated, it is spent; when it is dried, it is available for fertilizing and soil conditioning.

Corrosion Prevention

(Continued from page 35)

electrodes. Protection is obtained by immersing grounded anodes of the active metals in tanks. Corrosion then centers on these sacrificial anodes, which must be replaced periodically. Zinc, magnesium and aluminum are most commonly used.

Similar protective measures are adapted to pipe line protection by burying a series of anodes in the soil adjacent to the metal to be protected and connecting the two elements electrically. Current is usually supplied through a generator or rectifier. Use of magnesium sacrificial electrodes installed similarly for the protection of the municipal piping system of Lake Jackson, Texas, has recently been reported.

Care must be taken that there are no high-resistance joints in the pipe line which would cause the current to develop an anodic condition on one side of the joint.

BIBLIOGRAPHY

1. *Corrosion Handbook* edited by H. E. Uhlig (Wiley, 1948).
2. *Final Report of Advisory Committee on Scale and Corrosion in Potable Waters* (Office, Chief of Engineers, 1944).
3. *Water Purification Control*, E. S. Hopkins (Williams & Wilkins 1946).
4. *Selection of Deep Well Pumps*, by A. O. Fabrin (Jour. AWWA April, 1948).
5. *Corrosion Control with Calgon*, by Owen Rice (Jour. AWWA June, 1947).
6. *Principles of Cathodic Protection Design*, by L. P. Sudrabin and Frank P. McDonald (Jour. AWWA May, 1948).
7. *Costs of Corrosion to the Water Industry*, by H. E. Jordan (Jour. AWWA Aug., 1947).
8. *Report on Steel Pipe Lines for Underground Water Service*. Underwriters' Laboratory, Inc. Special Investigation (1936).

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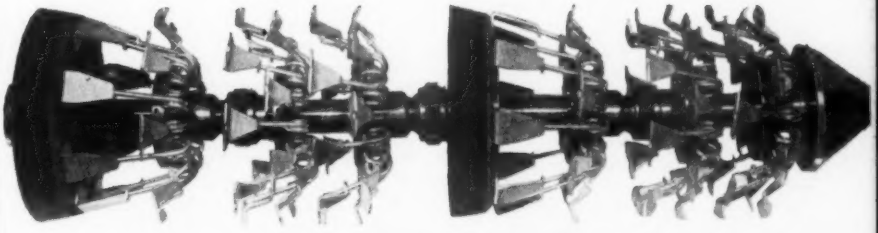

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With Flex-O Scrapers no experience is needed. You simply cut the pipe to insert the scraper, make another cut at the end of section for exit of scraper and cuttings. Turn on the Water—Flex-O does the rest.

All Flex-O Scrapers have exclusive Coil Spring Scraper Arms to ensure even tension on pipe wall throughout the entire cleaning operation. Flex-O Scraper arrangement gives pipe five complete scrapings.

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DES MOINES, IOWA

BETTER STREET MAINTENANCE FROM GOOD ORGANIZATION

Karl S. Masters, City Engineer, and J. H. Dimond, Civil Engineer in Charge, Buffalo, N. Y.

IN RECENT years, the City of Buffalo, N. Y., has combined under the supervision of one Engineer the several branches having to do with street pavement maintenance. Included are street paving; street pavement repairs; the Engineering Laboratory; sidewalk and lateral sewer and water connections; and the street repair yard.

The Street Paving Branch consists of a Civil Engineer, two senior transitmen, a draftsman and eight inspectors. One of the transitmen is assistant to the Engineer in Charge; the other is in charge of a field party with five engineering aides. The inspectors check all work to see that specifications are fully observed.

The Street Pavement Repairs Branch consists of a Clerk in charge of office detail; an asphalt repair locator who hack-marks an outline of the places to be repaired so that the repair crew can find them; and 6 inspectors who locate and measure all skin patches and cuts. During the winter these repairs are plotted on scale maps of the individual streets, using different colored ink for each year. This shows if patches overlap and indicates the proportion of the original pavement remaining.

The Engineering Laboratory is in charge of a Technician who has two assistants.

The Sidewalks and Lateral Sewer and Water Connection Branch consists of 13 men. A senior transitman is is charge. A Clerk issues permits for pavement cuts and checks bills for assessments for work done. Three inspectors check at the transit mix plant, locate and inspect sidewalks to be constructed under assessment procedures, and inspect all work done by plumbers under the pavements. A paver, cement finisher and three laborers construct and repair walks on city property. Three Engineering Aides stake out streets for sewer and water connections before paving.

In the Street Repair Yard are 26 men, including the Supervisor of Street Repairs, clerk, assistant foreman, paver, two curb setters, 18 laborers and 2 watchmen. The laborers act as truck drivers and paver and machine operators. The equipment at the Street Repair Yard are two 105-ft. I-R compressors, a Trojan grader and scarifier; a tractor with broom and plow attachments; three 3½ concrete mixers; a conveyor type power loader; 12 dump trucks; a portable tar kettle; and a stone spreader.

Macadam Maintenance

Buffalo has 50 miles of macadam pavements. All maintenance is done by city forces. The main thoroughfares are given a surface treatment yearly, the secondary streets every other year. If the surface is in bad condition, we scarify and grade, then apply about one-third of a gallon per square yard of hot road tar—New York State Highway item No. 73A—by distributor. This is followed immediately by spreading evenly about 15 to 20 pounds per sq. yd. of No. 1A stone on the hot tar. Traffic is allowed on the street as soon as stone is in place. We find this method inexpensive and the results satisfactory.

All new pavements carry a ten year guarantee. Any maintenance during that period is done by the paving contractor. From the time the pavement is released from guaranty until it is certified inexpedient to repair the maintenance is done either by contract or city forces. Broken or disintegrated stone curbing is replaced by city employees.

Patches and Repairs

All temporary repairs with cold patch, and shoves and depressions in the base, are cut out and the concrete base replaced. Where cuts are made in the pavement by plumbers or the Division of Water, the concrete base is replaced by city employees and the wearing surface replaced by the paving contractor having the street repair contract. The cost of replacement, where plumbers make the cut, is charged to the plumber. Where the cuts in the pavement are made by Gas and Electric companies they replace the concrete base and contract direct for the surface replacement, the work being done under city supervision.

Our general repairs to pavements are carried out under a yearly contract. The contractors bid on a series of units, such as, "Top and binder per ton laid for patching for cuts: 1½ inches of binder and 1½ inches of top."

The skin patching method is used for general street repairs. The area to be patched is outlined with hot asphaltic cement, using a small broom. The hot asphalt is placed and raked; the edges sealed with a hot iron and then rolled. Stone dust is spread over the patch (after rolling) and the surplus is broomed off.

In repairing cuts, the edges of the cut are painted with hot asphaltic cement. The binder is laid. Any portions that the roller cannot compress are hand tamped with hot irons. The asphalt is laid and rolled, the edges sealed with a hot iron, if necessary, and finished with stone dust.

Resurfacing

Many of our old brick, block stone and macadam pavements that are rough and uneven have been resurfaced. We remove the old stone curb, redress it and reset to line and grade. Any curbing not meeting specifications is replaced with new. The storm sewer branches are set to grade and line. The old pavement is thoroughly cleaned and, if necessary, a levelling course of binder is placed. The binder and sheet asphalt is then laid and after final rolling the gutters are sealed with hot asphaltic cement, stone dust is spread and the surplus broomed off.

For all repaving the old base and wearing surface are removed, also the old curbing. That portion meeting specifications is redressed and used again. The various operations in sequence follow:

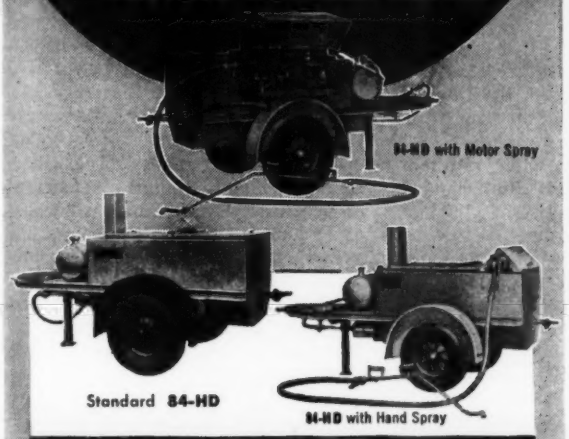
Drain tile is installed back of and below the curb. The necessary inlets or receivers are set to line and grade and connected to the main sewer. Curbing is set in a bed of concrete. The sub-base is fine graded and rolled. A concrete base of uniform thickness, either 6 inches for light traffic or 8 inches for heavy traffic, the proportions being 1 of cement, 3 of fine aggregate and 6 coarse ag-

speed up road repairs with a

LITTLEFORD

model no. **84-HD**

TAR AND ASPHALT KETTLE



84-HD with Motor Spray

Standard **84-HD**

84-HD with Hand Spray

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THE 84-HD is even more efficient with the addition of a Hand Spray or Motor Spray Attachment. These attachments make the 84-HD a real maintenance unit.

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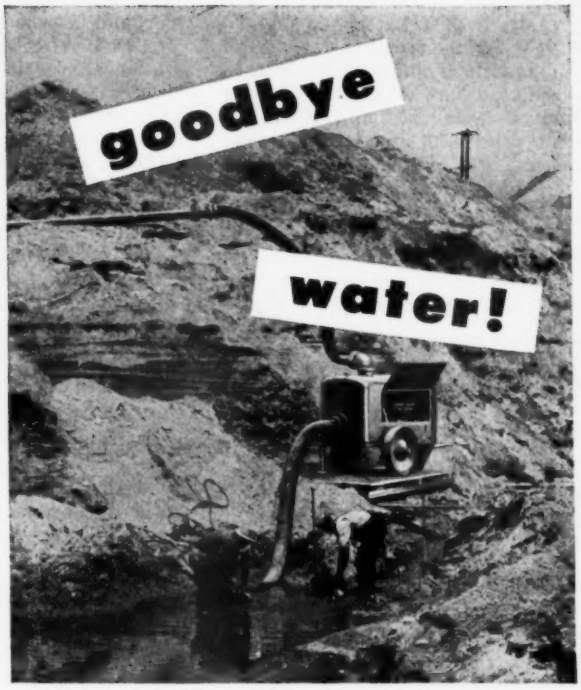

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gregate, is then placed and finished with a slightly rough surface. After the concrete is finished an approved asphalt cut-back material is pressure sprayed over the entire area of concrete. When Standard Portland cement is used the minimum time for curing is ten days, after which the binder and top is laid.

For light traffic 1½ inches of binder and 1½ inches of sheet asphalt wearing surface are used and for heavy traffic 1½ inches of binder and 2 inches of sheet asphalt are used. After the final rolling the gutters are sealed with hot asphalt cement, stone dust is then spread over the entire area and the surplus broomed off.

Driveways and approach walks between the curb and main sidewalk are replaced in kind. The dirt between the curb and the main sidewalk is graded on a direct grade and surplus material is removed. The pavement is then accepted.

City Pays for Sidewalk Snow Removal

C. H. PERRY
City Engineer, Marshfield, Wisc.

ONE of the vexatious problems of municipal officials is that of collecting assessments for the removal of snow from the sidewalks abutting private property. In most places, if the owners fail to clear the sidewalks within a specified time after a snowfall, the municipality has the work done and charges the cost back to the owners. However, bills for this work seem to engender much more resentment than do bills for other municipal services. There are frequent arguments regarding the number of snowfalls, the time required to perform the work, and the division of charges between adjacent lots with different ownership.

Several years ago the city of Marshfield solved this problem by inaugurating the practice of plowing all the sidewalks along the streets and charging the work to the snow and ice removal budget of the street department. At first thought to be too expensive, this practice has proven to be both comparatively inexpensive and a fine source of good relations.

Marshfield was fortunate in having standardized many years ago on a uniform five-foot width for sidewalks except in the commercial district. The few variations were all wider so a five-foot Vee type plow is used throughout the city. These plows are built in our own shops except for the hydraulic power hoists. The total cost, including the hoist, is approximately $155 each. Two plows are used. They are mounted on tractors which are utilized in the summer to mow weeds along our outlying roads, to cut hay for use in the city zoo and to pull a mixer on street oiling projects.

For plowing snow the tractor with greater weight has been found to be somewhat more efficient due to its better traction. The tires on both models are liquid filled to add weight.

A typical 4-inch snowfall recently required 30 man-hours of snowplow operation for removal. The direct cost, including labor and fuel amounted to $30.13. Even with an allowance of 5c per mile for indirect costs, the cost per mile for our 39 miles of sidewalk amounts to less than $1 per mile. It is felt that this operation definitely pays for itself in convenience to the public.—*Wisconsin Municipalities.*

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PUBLIC WORKS DIGESTS

Sewerage and Refuse . . 60

Water Supply 66

Highways and Airports . 72

● *This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.*

THE SEWERAGE and REFUSE DIGEST

Chlorinating at Less than Zero OT Residual

Numerous studies on prechlorination of sewage have shown that chlorination to less than an OT residual is effective in bacterial reduction and in control of hydrogen sulfide production, sewage septicity, and sludge bulking, as well as the control of sewage plant odors in general. It has, however, been difficult to control this type of chlorination because of the lack of chemical control methods. The authors present in this paper a method for the accurate measurement of such residuals, so that now prechlorination can be applied to these problems in a more intelligent and economical manner.

Frede B. Strandskov, Henry C. Marks and Donn H. Horchler—"Application of a New Residual Chlorine Method to Effluent Chlorination"; *Sewage Wks. Jour.*, January.

Recirculating Plant For Cannery Wastes

Experiments on a pilot plant at an English factory for processing fruits and vegetables showed that:

(*a*) Waste waters from fruit and vegetable canneries vary greatly in strength from season to season, the most difficult being produced by the canning of beetroot. The strength of such waste in terms of B.O.D. may be 1,500 to 2,500 ppm, but this figures does not reflect entirely the difficulty of purification which may be due, at least in part, to the small amount of nitrogen compounds in proportion to the large amount of carbonaceous matter present in the wastes.

(*b*) Effective screening and sedimentation may be expected to reduce the B.O.D. of the wastes by about one-third.

(*c*) Well-settled waste, diluted with recirculated effluent to give a mixture of B.O.D. approximately 250 ppm can be purified successfully by biological filters when applied at a rate of 100 gals. per cu. yd per day for a period not greatly exceeding 10 hours and followed by recirculation for the rest of the 24 hours.

(*d*) With such a system, sudden changes in the composition of the wastes brought about by changes in the kind of product canned do not have any appreciable effect on the working of the filters.

(Gallons in the article are British gallons.)

On the basis of the above, a plant was constructed for 12,000 gpd, containing two 6,600-gal. settling tanks, which discharged into a third to act as storage basin, as the treatment plant operates more hours per day than the canning plant. The basin discharges to a trickling filter at the rate of 1,000 gph, to which is added 5,000 gph of settled filter effluent. The rate of application to the filter is approximately 7 gal. of waste water per cu. yd. per day, the filter operating 13.5 hr. per day. During the canning season of 1948 the B.O.D. of screened waste varied from 341 to 2,480 ppm, and that of the effluent from 5 to 26 ppm. Virtually all color was removed.

An interesting feature was the construction of the circular filters. The walls were constructed of two concentric rings of precast concrete slabs 2" thick, tied together by rods, with the space between filled with reinforced concrete. It was filled with filter medium to a depth of 6 ft.

Denis Dickinson — "Performance of Recirculating Plant for the Purification of Cannery Wastes in Biological Filters"; *The Surveyor*, Feb. 11.

Trickling Filters For Supernatant Liquor

Discharge of excessive quantities of oil to the sewers of Riverside, Calif., upset the digesters and produced a supernatant liquor that could not be settled satisfactorily in the primary clarifiers, and a large volume of oil was carried over from these to the trickling filters, causing them to be badly ponded. Superintendent H. C. Parker decided to put the supernatant, which contained 16,000 ppm of suspended solids, directly onto the filters. This resulted in better performance of the clarifiers and reduction of the settled sewage load on the filters from a B.O.D. of 136 to 82 ppm. The result was that filter ponding began to clear up and soon the filters were in excellent condition.

"Supernatant Liquor Problem Licked." *Sewage Works Journal*, January.

Compressed Yeast Wastes

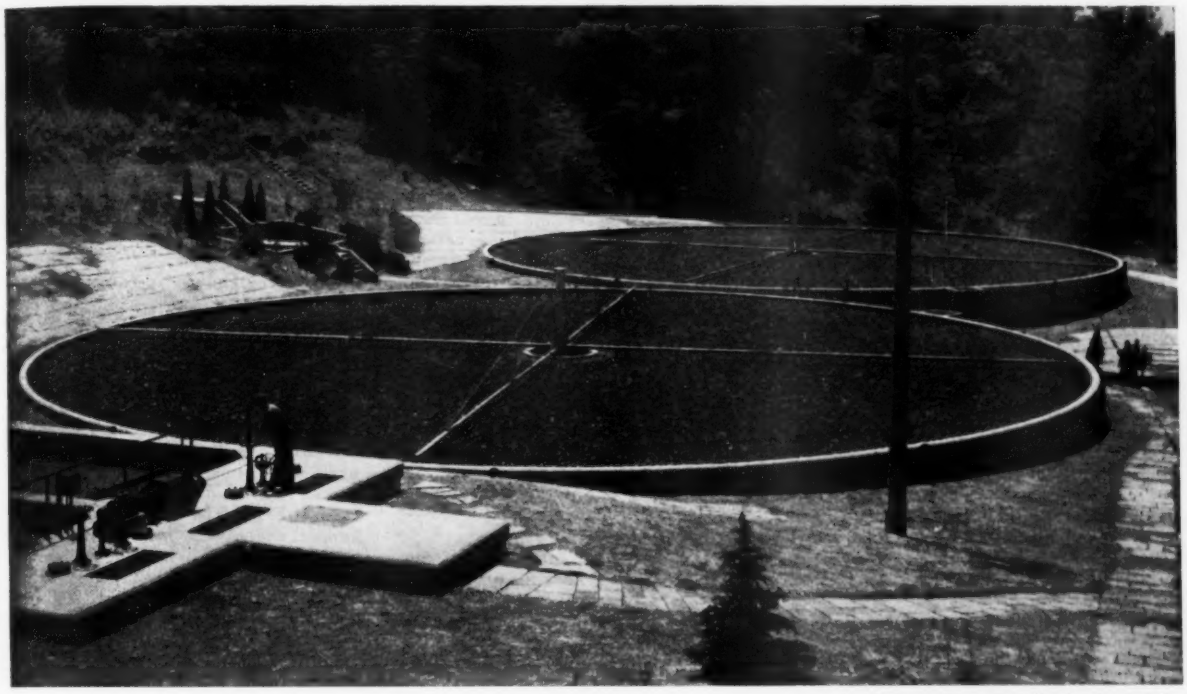
Studies in a laboratory pilot plant of anaerobic digestion and aerobic treatment by trickling filters of compressed yeast show that to obtain adequate and rapid digestion the sewage sludge used as seed needed gradual acclimatization. Adequate contact between seed sludge and material to be digested is necessary. This can be accomplished by mechanical agitation or by introducing the waste into the bottom of the digester by means of a rotating distribution, creating a continuous upflow and making use of the subsequent gas evolution to the fullest extent.

Lime was found to exert no beneficial effect on normally progressing digestion mixtures. Digestion for 24 hours resulted in B.O.D. reductions of 60 to 70%. This represented a B.O.D. loading of 0.12 lb. per cu. ft. of digester capacity.

The B.O.D. reductions accomplished by digestion are similar to those obtained with a 6-ft. experimental trickling filter. The B.O.D. reduction varies with the loading, from 50 to 95%. The volumes of gas produced are directly related to the extent of B.O.D. reduction, amounting to about 0.5 cu. ft. per gal. of spent nutrient. The composition of the gas is similar to that produced by digesting sewage solids.

Nearly all of the B.O.D. reduction occurred in the upper 4 ft. of the filter. Ammonia was lost during filtration, as

TODAY'S FILTER PLANTS : *use vitrified clay filter bottom blocks*



Designed by R. F. MacDowell, Cleveland, Ohio
Contractor: Couse & Saunders, Detroit, Mich.

Bedford, Ohio Gets Excellent Results With Its PFT Rotary Distributors

Pacific Flush Tank Co., makers of high quality sewage treatment equipment since 1893, have supplied many rotary distributors like that pictured above. The Bedford plant is designed to handle a flow of 2,000,000 GPD and has two 108' dia. PFT rotary distributors with a rock depth of 7' 0".

During 10 years of operation this plant has always produced a high degree of treatment. The filters have functioned efficiently and there has been no nuisance from this plant either sight, odor or in the receiving stream.

Like hundreds of other modern filters, the Bedford plant has underdrains built for lifetime, trouble-free service with *Vitrified Clay Filter Bottom Blocks*. These blocks, made by the members of the Trickling Filter Floor Institute, are scientifically designed to provide the proper ventilation and drainage needed for best operating results. Be sure to specify *Vitrified Clay Filter Bottom Blocks* on each job. For further details write any member of this institute.

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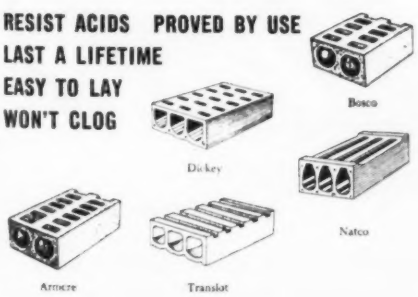

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indicated by assays and by the presence of ammoniacal odor in the atmosphere.

Willem Rudolfs and Eugene H. Trubnick—"Compressed Yeast Wastes Treatment: Biological Treatment in Laboratory Pilot Units"; *Sewage Works Journal,* January.

Detergents in Sewage Treatment

A study of the effect of non-ionic detergents on the purification of domestic sewage has been made for the English society "Imperial Chemical Industries" by L. W. Oldham, using a detergent known as "Lissapol N", an ethylene oxide condensate product. It was assumed that 1 oz. of this would be used daily by a family of three, giving a concentration in the sewage of 83 ppm. The experiments indicated that the presence of this detergent did not interfere with sedimentation; but in the experiments a very dilute solution of the detergent was acting on the solids, while in practice some of the solids would be emulsified by the detergent before discharge and the question was raised whether these emulsified solids would separate and settle. The detergent in concentrations up to 100 ppm did not cause anything approaching a complete breakdown of the activated sludge process during a short investigation, but exerted an appreciable detrimental effect on the quality of the effluent. It seemed probable that the detergent passes through the aeration process without being affected. It appeared to have no effect on the flaura and fauna of the river receiving it up to rates of 50 ppm.

"Synthetic Detergents"; *Municipal Engineering* (England), Feb. 4.

Purity Standards Of Sewage Effluents

There are no general legal standards of purity with which sewage effluents must comply in England. The Royal Commission on Sewage Disposal in 1915 recommended that an effluent should not contain more than 30 ppm of suspended solids and should not take up more than 20 ppm of dissolved oxygen in five days at 65° F, with the assumption that there would be at least 8-fold dilution in a stream having a dissolved oxygen absorption of 2 ppm, and that the stream after receiving the effluent would not take up more than 4 ppm of dissolved oxygen. However, this has never been given legislative effect, although several recent acts relating to large sewerage schemes have provided that all sewage shall be so treated that the effluent shall not only comply with the Royal Commission standard, but shall be free from offensive odor and shall not become dark colored when incubated for a period of five days at 80° F.

It may be taken, therefore, that the general standard of the Royal Commission represents the degree of efficiency now expected of inland sewage works. If an effluent complies with this standard, it will usually satisfy the requirements of river authorities and most riparian owners—unless the receiving stream is small in comparison with the effluent, or circumstances require a specially stringent standard.

J. H. Garner—"Sewage Effluents: Standards of Purification"; *The Surveyor,* Feb. 18.

Beverly Hills' Rubbish Incinerator

Beverly Hills, Calif., in 1948 put into service an incinerator for burning rubbish only, the garbage being fed to hogs, and cans and bottles salvaged. The combustible rubbish averages 85 tons a day with an analysis of approximately 10% paper, 47% brush and 43% leaves and grass cuttings; about 25% of which comes from the park department, which maintains 26,000 trees and 60 acres of parks. The material is discharged directly into two "Monohearth" incinerators, each with a capacity of 150 tons per 24 hr. To pass tree branches, etc., the charging openings are 7 x 3 ft. They are covered with motor-operated Beaumont-Birch doors. Ash is discharged into a conveyor trough filled with water, moved by steel flights to a bucket elevator, and lifted by this to a hopper, which discharges it into trucks for removal, there being no dumping ground near the plant. The operating cost, including

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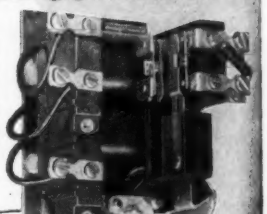

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supervision, has been 12¢ per cu. yd., which weighs an average of 180 lb.

H. J. Scott — "Incinerator Handles Garbage-less Refuse"; *American City*, February.

Cheektowaga's Refuse Incinerator

Cheektowaga, N. Y., destroys both combustible rubbish and garbage in two 75-ton "Monohearth" incinerators located on a main highway adjacent to the town hall. The charging floor is one story above grade; the stoking room, office, garage and personnel quarters are at grade; and beneath this is a depressed ash tunnel. Refuse is dumped onto the charging floor and pushed by a small, rubber-tired bulldozer to the feed holes, through which it is fed by laborers using rakes and forks. The furnaces are generally operated at 1400° to 1600° F, pyrometers permitting checking of this. Hot gases from the furnaces pass through combustion chambers on their way to the 100-ft. chimney. Ash and residue are dumped into hoppers equipped with quenchers, which discharge directly into trucks in the ash tunnel, 15 ft. below grade, which is reached by means of an elevator. (The elevator was calculated to be more economical than either a ramp or raising the entire building.) The ashes and residue are removed by a salvage firm which pays $1,000 a year for the concession. In the acceptance test, although the refuse had been thoroughly wet by rain, it was burned at a rate equal to or better than the guarantee rate of 3.12 tons per hr. per furnace.

Newell L. Nussbaumer—"Seven-in-One Incinerator Depot Replaces Unsightly, Unsanitary Dump"; *Eng. News-Record*, Feb. 17.

Suppression of Sewer Slimes

Sewer slime is an organic hodgepodge; every sample contains organisms of several classes and numerous species, differing in color, odor, texture and consistencies. Slime deposits grow most luxuriantly at the most usual level of flow in the sewers, where air and water are continuously present. The rate and even the class of growth may change with the temperature, the availability, and the biological composition of the slime—the balance between bacteria, fungi, protozoa and metazoa. Slime-forming organisms thrive on soluble carbohydrates, and increase in the use of garbage grinders is certain to make the control of sulfides in sewage more difficult.

From studies conducted at Los Angeles it is believed to be unlikely that all slimes on sewer walls can be suppressed or eliminated by chemicals added to the sewage. In fact, if the flow is sufficiently rapid and the temperature 70° or less, their activity may be beneficial, starting the sewage on the road to stability. But some types of sulfate-producing slimes apparently can be inhibited by chemical treatment of sewer

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surfaces. Cloroben was applied to the surface of a sewer that had been thoroughly cleaned, and at the end of a year no slime had formed; while a similar sewer similarly cleaned but not disinfected had, in 30 days, acquired a growth heavier and more vigorous than that removed. Such treatments exhibit the phenomenon of specificity; certain types of organisms are suppressed while others are unaffected.

C. W. Beardsley—"Suppression of Sewer Slimes"; *Sewage Wks. Jour.*, January.

Battery Vs. Standard Septic Tanks

A study was made in 1948 of the solids-removal efficiency of two septic tanks, one a standard rectangular tank of 800 gal. capacity, the other a battery of 7 units connected in series with a total capacity of 5,280 gal. During a two-month period similar sewage was discharged into both tanks at 2-hr. intervals during each 12-hr. day, each dose being 1/6 the total capacity of the tank and lasting 7 to 10 min. The battery tank removed an average of 93.8% suspended solids and 98.5% of settleable solids; the standard tank removed 84.1% of suspended solids and 94.5% of settleable solids. The effluent of the standard tank was invariably slightly black in color, that of the battery tank on only two occasions.

Harvey F. Ludwig — "Septic Tank Performance Under Surge Flow Conditions"; *Water & Sewage Works*, March.

Water Quality for Recreational Uses

These uses are classified as bathing, fishing, and boating and camping. For bathing, the items of most importance are absence of pathogenic organisms, of substances toxic to man, and of visible or foul-smelling substances such as oils, tars, scum, sludge deposits, etc. For fish life, presence of adequate concentrations of dissolved oxygen and sources of fish food, and absence of organic sludge blankets detrimental to spawning and of substances toxic to fish are the important features. For boating and camping the major factors are prevention of nuisance conditions and protection of the coatings and hulls of floating craft from deterioration; also appearance of the water acceptable from an aesthetic standpoint.

Albert H. Stevenson—"Water Quality Requirements for Recreational Uses"; *Sewage Works Journal*, January.

In-Service Training by Public Works Departments

The Dept. of Public Works of Los Angeles, Calif., is adopting in-service training as a means of improving the efficiency and increasing the morale of its 4,000 employees. The fundamental object is to save the city money, and the training is given on city time. If it is not considered that a given training course will result in a saving of the taxpayers' money well in excess of its cost, it is not undertaken. It is believed that the best instruction can be furnished by the various experts in the employment of the department—that it is simpler to equip an expert to be an educator than to make an educator into an expert. It is the general policy to limit the size of classes to between 10 and 25 employees, and the instruction periods from 1 to 3 hours in any given day.

The best training that has been done was in the sewer maintenance division. All employees of this division have been given a very comprehensive training program dealing with the following:

Administration and organization of the Department.
Pumping plants: equipment, operation and repair.
Planned pipe-line maintenance.
Industrial waste methods and practices.
How and where mosquitoes grow.
Methods of timbering excavations.
Electrical maintenance problems.
Disposal plant equipment maintenance.
Field tests of sewage.
Operation and maintenance of activated sludge treatment works.
Why in-service training.

Among the less comprehensive training courses given by other departments was one for truck drivers of the Refuse Collection Division. The cost of truck maintenance had been excessive, and a training program was developed, including motion pictures, models and lectures. Records of breakdowns and

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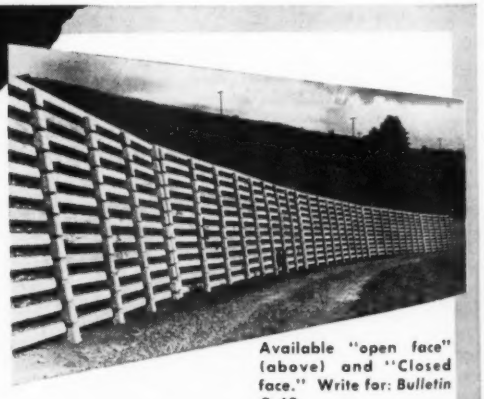

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repair before and after the training showed a definite improvement.

R. S. Dowey—"In-Service Training for Efficiency and Morale"; *Sewage Works Journal*, January.

BIBLIOGRAPHY

American City

Largest Sewage Treatment Plant in Country Will Correct Beach Pollution. February, Pp. 84-85, 141.

Kitchen Garbage Grinders, and Their Relation to the Public Works Field. February, Pp. 117- 119, 121.

Incinerator Handles Garbage-less Refuse. By *H. J. Scott*, Supt. of Streets, Beverly Hills Calif. February, Pp. 123, 139.

How Milwaukee Bought 46 Garbage Trucks. By *Joseph W. Nicholson*, City Purchasing Agent. March, P. 87.

The Future of Domestic Garbage Grinders. By *Mark Owen*, consulting engineer. March, Pp. 96-98.

How Sewer Service Charges Should Be Calculated. March, Pp. 117-118.

Civil Engineering

Federal Aid Is Called Insurance Against Ill-Advised Planning in Fight on Pollution. February, Pp. 25, 91.

Engineering News-Record

Seven-in-One Incinerator Depot Replaces Unsightly, Unsanitary Open Dump. By *Newell L. Nussbaumer*, consult. engr. Feb. 17, Pp. 54-57.

Midwest Engineer

Sewage Treatment for Trailer Coach Parks. By *Tom H. Forrest*, Consultant, Trailer Coach Mfrs. Assn. March, Pp. 4-6.

Municipal Engineering (England)

Synthetic Detergents: Effect on Sewage Treatment and River Pollution. Feb. 4, Pp. 49-50.

Soil Stabilization in Road Construction. By *L. J. Murdock*. Feb. 11, Pp. 56-57.

Performance of Recirculating Plant for the Purification of Cannery Wastes in Biological Filters. By *Denis Dickinson*. Feb. 18, Pp. 74-75.

Public Works

Garbage and Refuse Incineration Yields Revenue for Atlanta. By *H. J. Cates*, Chf. Engr., International Incinerator Co. March, Pp. 22-23.

Solving Savannah's Drainage Problem. By *D. D. Hankins, Jr.*, City Engr. of Savannah, Ga. March, Pp. 31-32.

Chemical Treatment of Packing House Wastes. By *Jack Huppert*, V. P. & Technical Dir., Texas Filter Co. March, Pp. 35-36.

Sewage Works Engineering

Industrial Wastes Treatment—A Review and Forecast. By the following state sanitary officials: *Arthur N. Beck, Herbert M. Bosch, E. W. Campbell, Charles G. Caldwell, H. C. Clare, H. P. Croft, H. J. Darcey, Earl Devendorf, F. C. Dugan, Russell A. Eckloff, V. M. Ehlers, Curtiss M. Everts, Jr., R. P. Farrell, H. B. Foote, George L. Hall, P. J. Houser, J. M. Jarrett, C. W. Klassen, David B. Lee, Oree Mauldin, F. L. McDonald, Richard Messer, Dwight F. Metzler, H. E. Moses, Loring F. Oeming, B. A. Poole, E. A. Reinke, Jerome H. Svore, W. W. Towne, Edward L. Tracy, F. H. Waring, K. S. Watson, Arthur D. Weston, W. W. White, L. O. Williams, William S. Wise*. March, Pp. 111-128.

Developments in the Treatment of Dye House Wastes. By *S. I. Zack*, Chf. San. Engr., Gannett, Fleming, Corddry & Carpenter. March, Pp. 129-130, 172.

Plating Wastes Treatment Plant a Highly Efficient Unit. March, Pp. 131-132.

Tannery Wastes Treatment. By *Howard T. Reuning*, Keystone Tanning & Glue Co. March, Pp. 133-167.

Tissue Paper Wastes Treated by Saveall Closed System. By *R. W. Simpson*, of Gilbert Associates. March, Pp. 134-135, 164.

Treatment of Wastes from Small Packing Houses. By *C. W. Klassen*, Prin. San. Engr., Ill. San. Water Bd., and *W. A. Hasfurther*. March, Pp. 136-138, 166.

Modern Equipment and Materials for Industrial Wastes Treatment. March, Pp. 139-144.

South African Municipal Magazine

Stormwater Intakes. By *H. von Eck*. January, Pp. 49, 51, 53.

The Surveyor (England)

Flow in Sewers. By *E. Dixon Grubb*. Feb. 11, Pp. 83-84.

Performance of Recirculating Plant for the Purification of Cannery Wastes in Biological Filters. By *Denis Dickinson*. Feb. 11, Pp. 89-90.

Sewerage and Sewage Disposal in 1948. Feb. 18, Pp. 101-104. Feb. 25, Pp. 117-119.

Sewage Effluents: Standards of Purification. By *J. H. Garner*, Chf. Inspector, W. R. Y. Rivers Bd. Feb. 18, P. 106.

Water and Sewage Works

Forced Circulation Type Hot Water Heat Exchangers for Digestion Tank Heating. By *John J. Baffa*, consult. engr. March, Pp. 85-90.

European Sanitary Engineering Impressions. By *J. V. N. Dorr*, Chairman, The Dorr Co. March, Pp. 110-111.

Aerobic Treatment of Rum Wastes. By *Clair N. Sawyer*, Assoc. Prof. of San. Chem., and *Earl J. Anderson*, Research Assoc. in San. Engr., M.I.T. March, Pp. 112-114.

An Introduction to the Micro-Biological Utilization and Disposal of Wastes. By *A. M. Buswell*, Chf., Ill. State Water Survey. March, Pp. 115-116.

We Do Our Digging With a Hydrocrane. By *Lloyd D. Knapp*, Supt. of Sewers, Milwaukee. March, Pp. 117-119.

Checking Sewer Velocity. By *T. C. Williams*. March, P. 120.

Septic Tank Performance Under Surge Flow Conditions. By *Harvey F. Ludwig*, Consult. Engr. March, P. 122.

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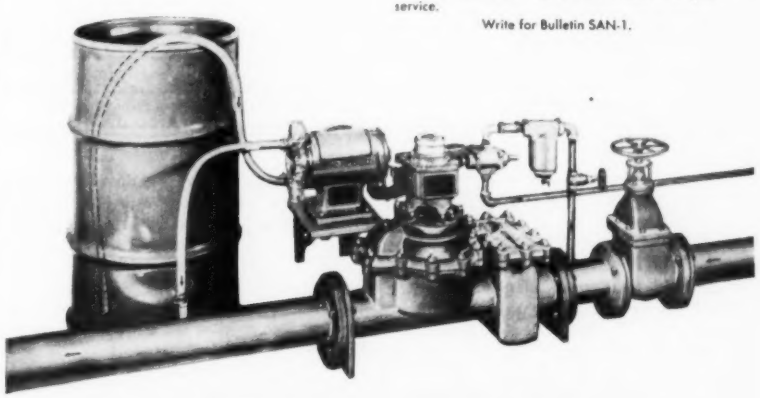

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The Water Works Digest

Financing System Development

Efficient and successful financing of water system development depends on continuity of nonpolitical management; operation of the system as a self-supporting business enterprise with sufficent autonomy to permit the maintenance of sound fiscal policies; the accompaniment of long-term physical planning by long-term financial planning; the availability of good bond laws; judicious selection of the borrowing medium and careful planning of bond-issues; and really informative public reporting and public relations that will develop and maintain confidence in the administration of a city and its water system.

Water system development includes replacements; extensions of the distribution system; and additions and improvements to supply, storage, pumping, purification, transmission and the like. These three classes of improvements may very properly be financed in different ways, but will generally be by issuing bonds, which have good possibilities for being marketed at lower interest rates than the general-purpose bonds of a municipality. In recent bond sales by two cities, one which provided for depreciation, payment to the city for services and property and utility taxes, and which both made the bonds unlimited tax obligations of the city and also pledged itself to pay principal and interest from water revenues, sold its bonds on a 2.1% basis while another which employed a different fiscal policy sold on a 3.2% basis.

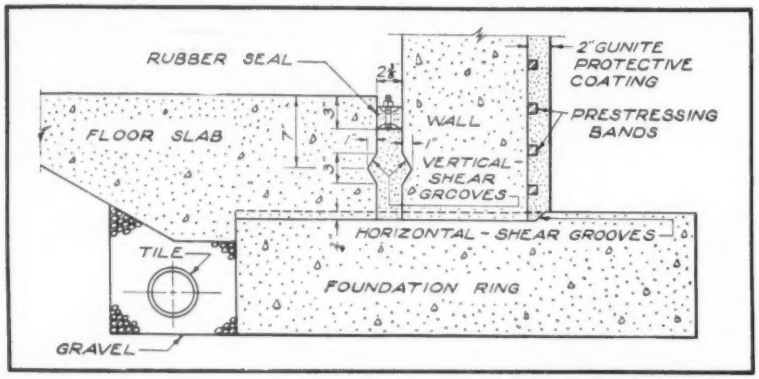
Three general types of bonds are employed: ordinary general-obligation bonds; revenue bonds; and bonds secured by a pledge not only of earnings but also of the faith and credit of the municipality. A financially sound municipality can usually sell its general-obligation bonds to better advantage than its revenue bonds. The cheapest method of financing a self-liquidating water system by a municipality whose credit is good, is the use of bonds that carry a pledge both of the taxing power and of earnings.

Frederick L. Bird — "Financing Water System Development"; *Journal, Amer. Water Works Ass'n*, February.

A Joint Seal For Reinforced Concrete Tanks

In constructing prestressed concrete tanks, an open space 2" or more wide is left between the edge of the floor slab and the wall, to permit the contraction of the latter caused by the prestressing. Later this annular space increases and decreases in width as the water level in the tank rises and falls. The space is ordinarily filled, after prestressing, with rich cement mortar containing iron dust, the dust causing expansion as it rusts. However, as the tank expands on being filled, the seal leaks more or less. A type of seal, used on 12 tanks built during the past 10 yrs. by the East Bay Municipal Utility District, Calif., has entirely eliminated this trouble.

In making this seal, the annular space is filled to within 3" of the top of the floor with 1:3 cement mortar (a horizontal groove in both floor slab and wall is provided to prevent uplift by earthquakes), and above this is placed a ring of pure Hyvea rubber 1½" x 2", between top and bottom rings of steel strips of half-oval cross-section. Bolts pass through these strips and the rubber, located at 6" intervals, and after the rubber ring has been placed in position these bolts are tightened, squeezing the rubber to a tight fit against the concrete wall and floor slab, the pressure against the concrete being 900 to 1900 lb. per linear foot of water stop.



Courtesy Water Works Engineering

● ***A JOINT SEAL that prevents leaks in pre-stressed concrete tanks.***

R. C. Kennedy—"An Effective Joint Seal for Reinforced Concrete Tanks;" *Water Works Engineering*, February.

Chlorination in Swimming Pools

The Ministry of Health of England some years ago recommended that 0.2 to 0.5 ppm of chlorine be applied to swimming-pool water. Under certain conditions this may be satisfactory, but many superintendents have adopted break-point chlorination instead. The author says:

"In our opinion the range of 0.2 to 0.5 part per million of chlorine formerly recommended officially is undesirably low for general use in freshwater swimming baths. We would suggest that under normal conditions a residuum of 1 part per million in the water during bathing is a desirable amount, but that an increase to 2 parts per million will not generally be found to cause discomfort, and will be advantageous from the aspect of maintaining the bacterial purity when there is a heavy bathing load."

Roy C. Hoather—"Control of Chlorination in Swimming Baths;" *Municipal Engineering* (England), Feb. 11.

Dry Ice For Recarbonation

In softening its water supply, the village of Wyoming, Ohio, population 12,500, has adopted the use of commercial carbon dioxide for recarbonation, in place of the conventional flue gas. The latter it found to be inflexible in response to changing loads and expensive to maintain, requiring frequent repairs. In the new method, dry ice is delivered in 50 lb. cubes and placed in converters, where it becomes gaseous in about 24 hr. and is fed through a pressure regulator and a rotameter to a diffuser consisting of a 15-ft. length of porous canvas hose suspended in the recarbonation downcomer. The advantages of this method are: 25% increase in length of filter runs due to uniformity and continuity of treatment, with consequent saving in backwash water; improved physical condition of the filters; 30-40% saving in labor; greater cleanliness; ease of adjusting dosages; elimination of sulfurous tastes and odors; and of shutdowns for re-

pairs. The total cost, including fixed charges and materials, but not labor or scrubbing water, is estimated at $3 per mg. for flue gas recarbonation and $6 for that by commercial carbon dioxide. The additional cost is considered to be far outweighed by the advantages.

Fred G. Gedge—"Use of Commercial Carbon Dioxide in Lime Softening;" *Jour. Amer. Water Works Ass'n*, February.

Certification of Waterworks Operators

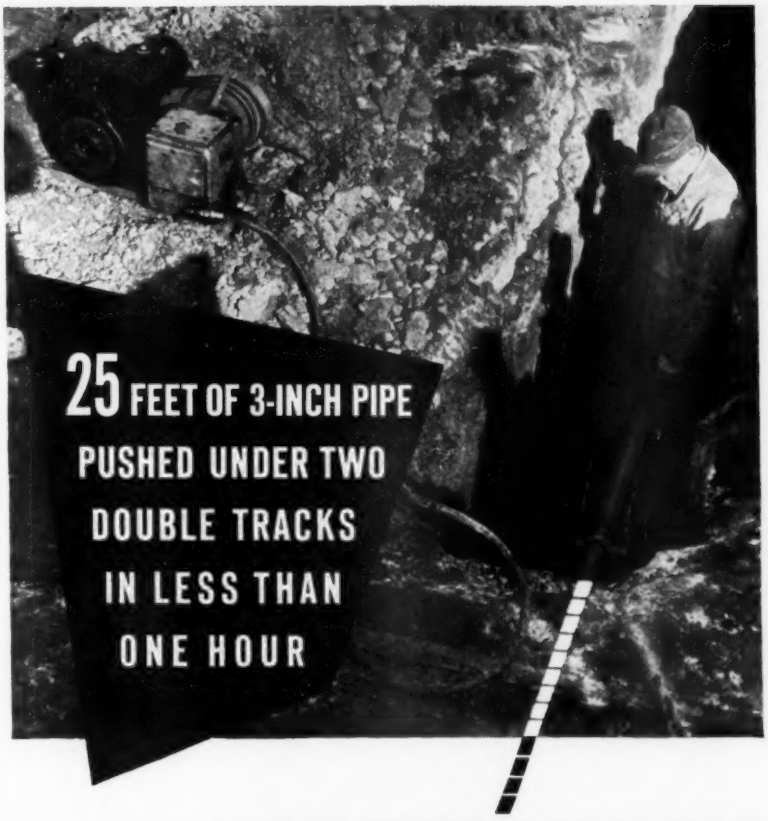
Only 8 states have, by legislative act, vested the state health department with some degree of authority over the control of water works operators in the state. Twelve other states operate under a voluntary licensing or certification plan, administered either by the state health department or the state waterworks association, or jointly by both. Several are considering a voluntary program. It is generally accepted that certification or licensing of water superintendents, operators, chemists and other waterworks personnel in a responsible position is advantageous not only to the individuals concerned but also to the public, local officials and the state health departments. (The term "certification" is preferred to "licensing".)

A Special Licensing Committee of the Southwest Section of the AWWA, from whose report the above is abstracted, has formulated general recommendations for a standard type of licensing or certification program. These provide for an examining board having authority to issue certfiicates, bring suit to enforce compliance with the law, and formulate rules and regulations. Certification should be mandatory. There must be some provision for a broad general training program for new operators as well as present ones. More short courses and related facilities should be made available; to be supplemented by correspondence courses, books and manuals. Waterworks should be classified on the basis of population served, type of treatment and source of supply; and certificates be graded to denote the class of plants as well as the responsibility of position for which the operator is certified.

"Licensing Laws and Practices in the United States;" *Jour. Amer. Water Works Ass'n*, February.

Experience With Zeolite Filters

Clarksburg, W. Va., in 1939 installed four zeolite natural greensand softeners, containing 66" of greensand. After 3 yrs.' operation the depth of the greensand was found to have decreased 12" to 24" in the four filters. Greensand was found in the clearwell and in the creek into which the wasted water ran, and it was surmised that it had been washed through the supporting gravel and underdrains. The underdrains were found to be in good condition, so apparently the upper layer of 3/16" gravel supporting the sand was not fine enough. To remedy this, a 3" layer of torpedo gravel, 0.8 to 1.0 mm in size,



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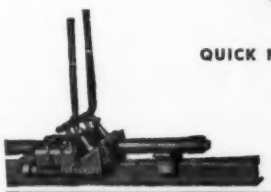

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was placed in each softener under the greensand. As an additional precaution, the initial flow of wash water was cut in half until it was passing freely through the beds, when it was increased to its original rate. Since then no appreciable loss of greensand has occurred.

Soon after the softeners were placed in operation they showed signs of clogging, and amorphous matter was found on the grains of greensand. Neither saturated salt brine nor copper sulphate prevented this growth, which was fostered by abundant sunlight and the practice of leaving the beds, when idle (because the water did not need softening), with water in them standing slightly above the sand. Believing that removing either sunlight or moisture would prevent this growth, the beds are now drained and allowed to stand dry when not in use, and this trouble has not recurred.

Perkins Boynton and Henry Gay—"Maintenance of Zeolite Filters;" *Jour. Amer. Water Works Ass'n,* February.

Mechanism Of Flocculation

Most studies of flocculation have centered on the chemical characteristics of the coagulant chemicals and the dissolved constituents of the water; little attention has been paid to the properties of the particles constituting the turbidity. At the Sanitary Engineering Laboratories of the University of California, comprehensive flocculation studies were undertaken, employing synthetic turbid waters prepared with soils of predetermined character. These indicate that an important and controlling factor in the clarification process with coagulant chemicals is the cation exchange capacity of the turbidity particles. If this capacity is exceptionally high in the presence of about 25 ppm of carbonate alkalinity, the water will flocculate readily following prolonged agitation and the addition of any suitable electrolyte yielding active cations. Normal waters of lower exchange capacities are flocculated efficiently only in the presence of a suitable binder material such as hydrous oxide or basic salt formed by the hydrolysis of alum or ferric coagulants within certain pH limitations. The hydrolysis proceeds only after the soil particles have been substantially saturated or destabilized with cations of the added coagulant. An amount of coagulant proportional to the exchange capacity must be added to furnish the destabilizing cations, and more coagulant must be added to furnish the necessary binder material. The destabilizing action conditions the turbidity particles so that they tend to aggregate, and the hydrous oxide, through stirring or other proper agitation of the system, binds the particles together to effect rapid agglomeration and relatively large dense flocs. In order to secure the maximum turbidity reduction with the minimum coagulant dosage, it is necessary that there be a proper balance between the portions of the added alum made available for the exchange and hydrolysis reactions and the actual exchange and hydrolysis demands of the water. The balance may be affected by modifying the pH of the water, and the pH at which the best balance is attained may properly be termed the "optimum pH" for that water.

The addition of either negatively charged sodium-bentonite or activated silica (partially neutralized sodium silicate), by increasing the exchange capacity of the water sufficiently, may decrease the binder or hydrolysis demand to zero. A characteristic feature of this type of flocculation (unaided perikinetic) is the production of large watery flocs and a greater volume of sludge.

Because of the many variables, no simple mathematical formulation of flocculation phenomena is possible, but these may nevertheless be explained through an understanding of the exchange and hydrolysis reactions involved. Proper consideration of these two basic reactions will not only assist in making correct deductions but will serve to explain many of the apparent contradictions which have been reported in flocculation studies and practice.

W. F. Langelier and Harvey F. Ludwig—"Mechanism of Flocculation in the Clarification of Turbid Waters;" *Jour. Amer. Water Works Ass'n,* February.

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Billing Bi-monthly

In 1943, largely because of war shortages and other conditions, Los Angeles, Calif., began billing its domestic electric and water accounts once every two months instead of monthly. At that time there were 850,000 active accounts, which had increased to 967,111 by June 30, 1948. In 1943 the commercial division handled 1187 active accounts per employee. In Dec., 1947, the number per employee was 1615. If billing were now on a monthly basis, 211 more employees would be needed. The savings in their salaries, in postage, paper, etc., amounts to about $750,000 a year; and the customers have saved $100,000 a year in check and postage expenses.

The customers approve of the plan. In June 1948 only 0.09% of services were shut off for nonpayment of bills, compared to 0.11% in 1942. Uncollectible bills dropped from 0.116% in 1942 to 0.034% in 1945. Between 1943 and 1948 the consumption of water per consumer had increased 19.8%, and of electricity 50.7%.

Franklin W. Roberts—"Experience in Bimonthly Billing;" *Jour. Amer. Water Works Ass'n*, February.

Nitrates in Water Supplies

Drinking waters containing 10-20 ppm or more of nitrate nitrogen appear to be the cause of methemoglobinemia ("blue babies") in infants, particularly when they are given the water as part of a modfied milk formula. The distribution of such waters appears to be confined mostly to rural dug wells in which a surface influence may be felt—probably caused chiefly by clover and legumes or other plant life. A simple remedy seems to be the abandonment of the affected well and substitution of a properly located and developed drilled well.

F. Holman Waring—"Significance of Nitrates in Water Supplies;" *Jour. Amer. Water Works Ass'n*, February.

Using Lime For Corrosion Control

The fixation of aggressive carbon dioxide by using the correct quantity of lime causes a dense, compact coating of calcium carbonate-ferric oxide to be deposited on pipe walls. This coating, if of proper density, prevents the diffusion of the dissolved oxygen in the water to the hydrogen film on the iron, thereby retarding corrosion. The lime treatment is not satisfactory for very low alkaline waters (10 ppm or less) since overly high pH values are required, depositing a soft, fluffy sludge-like coating which is porous and sometimes of sufficient volume to retard flow. For accurately controlling lime dosage, recording potentiometers are valuable; commercial dry feeders and slakers are desirable for the most economical and effective application. Even though complete elimination of corrosion may not be attained by lime treatment, the value of the reduction, where the water is

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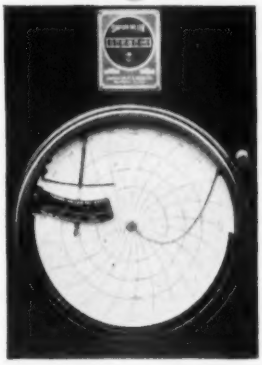

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fairly corrosive, greatly exceeds the cost of treatment.

Edward S. Hopkins — "Corrosion Control by the Use of Lime;" *Water & Sewage Works,* March.

Industrial Consumption And Accounted-For Water

The Kenosha, Wis., water department accounted for 94.5% of the water pumped in 1944, but this had dropped to 87 in 1946 and 85% in 1947. This meant a serious loss of income, and the reason was sought. The venturi meter which measured the pumpage was checked as correct within 0.7%. No increased underground leakage in the distribution system was detected. No under-registration of large meters at industrial plants could be found; and of the 12 large compound meters, only one under-registered and 6 over-registered 1 to 5%.

There were 11,185 residential and commercial meters. These are checked for accuracy at an average interval of 7.1 yr. Each is read at 6-month intervals, the taking of readings being continuous throughout the year. Thus the total amount billed to most of the meters in a given year included one to 5 months' consumption of the previous year in the 12 months covered by the record of the amount pumped. This was suggestive; but more so was a study of the relation between accounted-for water and industrial consumption. The latter increased from 22% of the total pumpage in 1940 to 58% in 1944 due to war industries; then fell to 35% in 1946. During the same period the percent of accounted-for water increased from 88.7% to 94.5%, and fell to 87%. In other words, the total increase in consumption was almost exactly the amount indicated by the industrial meters. Study of the records of the Racine, Wis., water works showed an even more striking similarity. This seems to indicate that responsibility for decrease in accounted-for water must lie with inaccuracy of the small meters, or leakage in the distribution system, or both.

H. T. Rudgal—"Industrial Consumption Effects on "Accounted-for Water;" *Water & Sewage Works,* March.

LABOR COSTS IN OUR METER SHOP ARE 'WAY DOWN SINCE WE HAVE PRACTICALLY ALL BUFFALO METERS IN THE SYSTEM
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BIBLIOGRAPHY

American City

A New Method for Cleaning Settling Tanks. By *Fred V. H. Piper,* Dir. Water Dept., Niagara Falls. February, Pp. 102-103.

A Small Water Department Checks Leakage. By *Cecil W. Browning.* March, Pp. 82-83.

American Water Works Assn. Journal

Financing Water System Development. By *Frederick L. Bird,* Dir. of Mun. Research, Dun & Bradstreet. February, Pp. 105-110.

Licensing Laws and Practice in the United States. Committee report. February, Pp. 111-127.

Experience in Bimonthly Billing. By *Franklin W. Roberts,* Dept. of Water & Power, Los Angeles. February, Pp. 128-130.

Water Quality Control in California. By *Frank M. Stead and Edward A. Reinke,* Calif. Dept. of Pub. Health. February, Pp. 131-138.

Saginaw-Midland Water Supply Project. By *Louis R. Howson and Vernon R. Kneer,* of Alvord, Burdick & Howson. February, Pp. 139-146.

Significance of Nitrates in Water Supplies. By *F. Holman Waring,* Chf. Engr., Ohio Dept. of Health. February, Pp. 147-150.

Improvements to Hialeah Treatment Plant. By *Clarence R. Henry,* Chf. Chemist, Dept. of Water & Sewers, Miami, Fla. February, Pp. 151-158.

Use of Commercial Carbon Dioxide in Lime Softening. By *Fred G. Gedge,* Supervisor, Wyoming, Ohio. February, Pp. 159-162.

Mechanism of Flocculation in the Clarification of Turbid Waters. By *W. F. Langelier,* Prof. of San. Eng., Univ. of Calif., and *Harvey F. Ludwig,* Cons. San. Engr. February, Pp. 163-181.

The Public and Water Rate Increases. By *John H. Murdock,* Jr., V. P. Water Works Service Co. February, Pp. 182-186.

Maintenance of Zeolite Filters. By *Perkins Boynton* and *Henry Gay,* Chf. and Asst. Chemists, Clarksburg, W. Va., Water Bd. February, Pp. 187-188.

Diagnosing Water System Defects. By *R. D. McGill,* Engr. H. Nutting Co. February, Pp. 189-194.

Furnishing Equipment to Employees. By *Duncan A. Blackburn,* Prin. Engr., Pasadena, Calif., Water Dept. February, Pp. 195-198.

The Selection and Care of Water Meters. By *Charles Bachmann,* Factory Engr., Neptune Meter Co. February, Pp. 199-203.

Emergencies in City Water Service. By *Whitworth Cotten,* City Engr., Petersburg, Va. February, Pp. 204-206.

Replenishment of Ground Water Supplies. By *E. W. Bennison,* Office Engr., Edward E. Johnson, Inc. February, Pp. 207-208.

Proposed Water Rate Schedule. Michigan Section Committee Report. March, Pp. 209-221.

The Causes and Prevention of Water Losses. By *Homer E. Beckwith,* Dist. Mgr. Pitometer Co. March, Pp. 222-226.

Measuring Pump Performance During Operation. By *N. C. Ebaugh,* Head, Mech. Eng. Dept., Univ. of Florida. March, Pp. 227-236.

Maintenance of Electrical Equipment. By *W. J. Seibert,* Gen. Elect. Co. March, Pp. 237-241.

Effect of Water Quality on Ornamental Plants. By *Harold E. Pearson,* Chemist,

Met. Water Dist. of Southern Calif. March, Pp. 242-248.
The Value of Consumer Complaints. By *Laurence L. Camy*, Local Mgr. Calif. Water Service Co. March, Pp. 249-252.
Ground Water in Wyoming. By *Donald A. Warner*, Ground Water Geologist, Wyo. State Eng. Office. March, Pp. 253-256.
Tentative Standard Specifications for Filtering Material. Approved by Directors of A.W.W.A. March, Pp. 289-304.

Civil Engineering

Delaware Aqueduct to Increase New York's Water Supply Fifty Percent. By *Roger W. Armstrong*, Eng. Consultant, N. Y. B'd. of Water Supply. February, Pp. 17-21.

Engineering News-Record

Action on Groundwater Problems. By *William E. Warne*, Asst. Secy., U. S. Dept. of Interior. Feb. 17, Pp. 63-64.
How to Design River-Intake Pumphouses. By *S. B. Roberts*, Chf. engr., Celanese Corp. of America. March 3, Pp. 52-56.

La Technique de l'Eau (Belgium)

Etude et Traitement des Eaux de Surface. By *M. A. van de Vloed*, Chief of Antwerp Waterworks Laboratories. February, Pp, 5-13.

Maine Water Utilities Assn. Journal

Lowering a 30-Inch Water Main. By *Milton Thorne*, Supt. of Portland Water Dist. March, Pp. 17-21.
Tank Maintenance. By *Whitworth Stokes*. March, Pp. 27-33.
Use of Fluoride in Drinking Water. By *Harold B. Scales* and *Paul G. Butler*, Chemists of Portland Water Dist. and Bangor Water Dept. respectively. March, Pp. 34-39.

Municipal Engineering (England)

Control of Chlorination in Swimming Baths. By *Roy C. Hoather* and *G. J. Laws*. Feb. 11, P. 60.

Public Works

Tacoma Brings in Record Water Well. By *A. R. MacPherson*. March, Pp. 27-28.
Earning Your Salary by Better Management. By *Clifford M. Parrish*. March, Pp. 28, 34.
Mobile Pumping-Chlorinating Unit. By *M. J. Shelton*, Chf. Engr., and *L. L. Flor*, San. Engr., Lemon Grove & Spring Valley Irrigation Dist., Calif. March, P. 30.
Milwaukee May Add Fluorine to Water. By *John E. Hubel*. March, P. 68.

The Surveyor

Water Requirements in Rural Districts. By *J. E. Busfield* and *R. J. Miller*, Engineers, Rural District Council. Feb. 4, Pp. 74-75.
Chlorination of Water Supplies. From Report of Metropolitan Water Board. Feb. 25, Pp. 121-122.

Technique Sanitaire et Municipale (France)

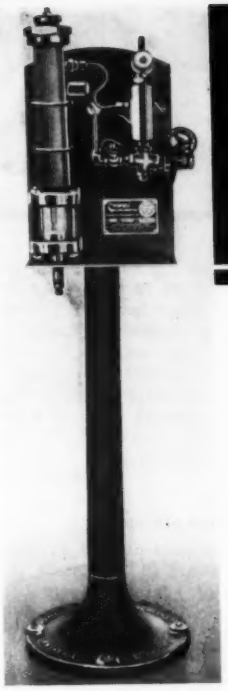
La Filtration Lente des Eaux de Riviere. By *M. G. A. Schroeyers*, Engineer of Antwerp Waterworks. Sept.-Oct., Pp. 101-105.
L'Elimination du Plancton Lacustre par des Filtres Rapides d' Un Systeme Nouveau. By *Jean Ph. Buffle*, engineer-chemist, Geneva Water Works. Sept.-Oct., Pp. 106-119.

Water and Sewage Works

Corrosion Control by the Use of Lime. By *Edward S. Hopkins*, Assoc. Engr., Baltimore Bureau of Water. March, Pp. 94-96.
Industrial Consumption Effects on "Accounted-for-Water." By *H. T. Rudgal*, Supt. Water Dept., Kenosha, Wis. March, Pp. 97-100.
24-Inch Cast-Iron River Crossing Installed in Kankakee, Ill. By *Dewey Johnson*, Asst. Engr., Cast Iron Pipe Research Ass'n. March, Pp. 101-102.
Reservoir Construction Costs Lowered by Underdraining Subsoil. March, Pp. 103-104.

Water Works Engineering

Havana, Cuba, Celebrates Arrival of New Water Supply. By *Gonzalo de Quesada*. February, Pp. 120-122.
An Effective Joint Seal for Reinforced Concrete Tanks. By *R. C. Kennedy*, Asst. Chf. Engr., East Bay Mun. Utility Dist. February, Pp. 131, 155.
The Blue Hole, Ohio's Most Unusual Natural Spring. By *Wilbur Stout*, Ohio State Geologist. February, P. 138.
Fire Hazards When Employing Electricity to Thaw Pipes. February, Pp. 130, 155.



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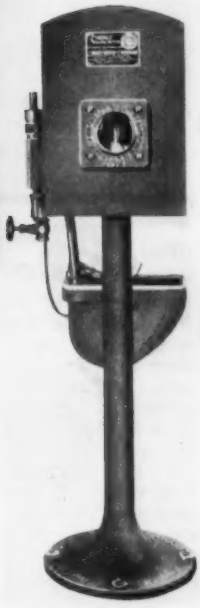

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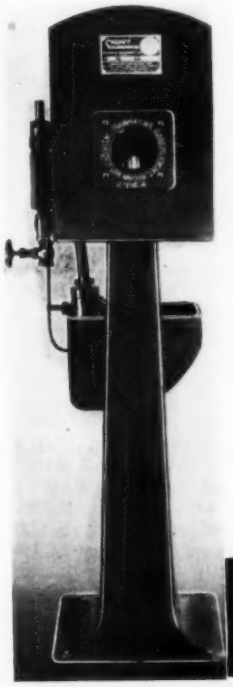

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The Highway and Airport Digest

Effect of Traffic Lines in Holland

In 1948 a test was made on some of Holland's state roads of traffic lines using Prismo spheres. Opportunity was taken to study the behavior of drivers before and after the application of the traffic line, during both day and night. At one point the middle 7.2 meters of a 4-lane road was divided into strips 0.4 meter wide, indicated by rectangles 0.40 x 1.00 m., alternate ones painted white, and numbered consecutively each side of the center line; by which observers could note the location of each passing vehicle with reference to that line. The results showed that drivers of motor vehicles kept better to their own lane, especially at night, than before the traffic line was applied. Among the results found were that 19.9% of passenger cars kept to the outer lane before application and 62.0% afterward on straight roads, and 10.3% and 43% respectively on curved ones. For trucks and buses the figures were 27.0% and 62.8%, respectively, on straight roads and 10.8% and 39.1% on curved.

"Verkeersbeveiliging met Prismo-Verf"; *Wegen,* January.

Cradled Tile Culverts

The Commissioners of Allegheny Co., Pa., in building a 2.58 mile stretch of road in saw-tooth terrain, found it necessary to build 27 culverts of 18" to 72" diameter and 100 to 692 ft. long. The steepest is a 36" pipe which drops 25.76 ft. in a length of 224 ft. Most of the culverts up to 36" diameter were built of encased extra-strength vitrified clay pipe laid in the stream bed. The pipe was encased up to the spring line in concrete 12" thick under the invert and 9" at the spring line. A line of 6" perforated clay pipe was laid next to each side of the concrete cradle, nearly at the grade of its bottom, and covered with gravel, to remove seepage water.

S. M. Madancy—"Cradled Tile Culverts"; *Am. City,* February.

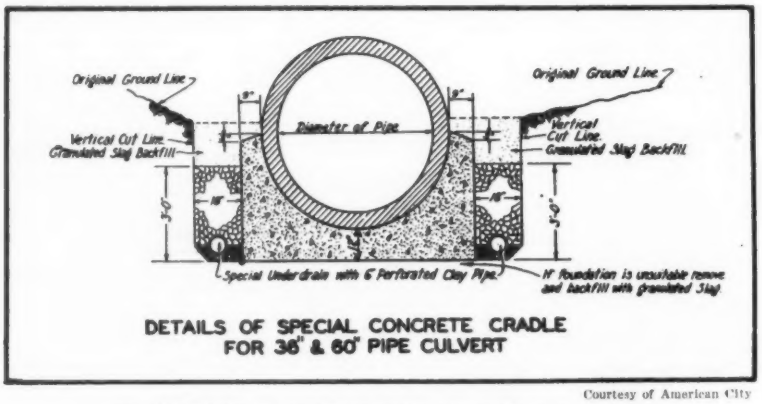
Higher Cost of Highway Construction

The basic elements of cost of highway construction are (1) materials, (2) wages, and (3) equipment rental or ownership cost. Other factors, such as overhead, supervision, etc., are usually proportional to these. Records of recently completed California highway construction projects show that labor costs form 45% of the total, materials 27%, equipment 23%, and overhead 5%.

A comparison of costs in 1940 and in 1948 showed that those of materials in general had increased 83% and freight rates 44%. During the same period, wages increased 98%; but labor productivity is only 65% that of 1940, which is partly offset by increased mechanization in highway construction and 75% decrease is estimated as the net loss in productivity. This results in the figure of 164% as the increase in labor costs. The cost of new equipment is stated by one authority to be 88% greater than in 1940; and the Public Roads Administration estimates that cost of equipment ownership and operation is 60% greater than in 1940, with costs rising sharply as the old equipment is being replaced with the more costly new. Combining these costs of labor, materials, equipment and overhead with the percentage each item forms of the total cost, shows the total contractors' cost to be 121.45% greater than in 1940.

An analysis of contract costs for highway work in California for the year ending June 30, 1948, show these to have been 116.8% greater than for similar work in 1940. With the numerous assumptions that must be made, it is not believed that the difference between 121.45% and 116.8% has any significance, and an estimate of present costs as 2.2 times those of 1940 seems justified. The increase does not seem to be due to the large amount of work offered, since this was only 8.4% of the total bidding capacity of the prequalified contractors. Increasing the size of contracts seems to have kept prices down rather than increased them.

Richard H. Wilson, Henry C. McCarty and Richard R. Norton—"How Will Highway Costs Affect the Highway Program"; PUBLIC WORKS, March, and *California Highways,* January-February.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Surfacing Suburban Streets

In Kent Co., Michigan, many miles of streets lined with homes are not part of any incorporated city or village. For improving these streets arrangement is made between the townships in which they are located and the county, the latter doing the construction and maintenance and the former paying the bills. In the case of the more important streets, the county graded down to 6" below the permanent street grade and laid 6" of gravel, and black top. Less important streets were graded to a compromise temporary grade, and covered with 4" of compacted gravel and black top. The former type of improvement (including drainage) costs about $20,000 per mile, the latter type $8,000. In the former, the gravel is made 21 ft. wide and compacted with a pneumatic roller when screened and crushed is used, or with a "Beach" open grid type roller when bank gravel is used. The surface is given a light tar priming and two seal coats. The soil is sandy, and drainage is provided by building leaching basins 6 ft. diameter and 6 ft. deep.

For many years the county purchased processed gravel, but recently it installed two gravel plants of its own, the first including a 1024 jaw crusher, followed by a similar one with a 1036 crusher better adapted to handling pit-run material. Each machine has been

moved about once a week during the working season, the rubber-tired equipment being drawn by a snow truck; the time consumed being from one half a day to a full day, for distances up to 30 miles. The costs for gravel have varied between 35 and 45 cts. per cu. yd. for production, plus 15 cts. payment to the farmer. The charge to the townships in 1948 for material delivered and tailgated on the streets was 60 cts. plus cost of haul; based on a rental of $8.81 per hour for plant equipment (including gas, oil and repairs); $4.90 for the shovel or dragline used for feeding the crusher,and portal-to-portal pay of 9 hrs. for the crew. Sand is used for seal cover and for sanding roads in winter; and a 12″ blanket of sand under a 6″ gravel roadbed is an almost perfect insurance against frost damage. Sand costs 5 cts. per cu. yd. paid to the farmer, 20-25 cts. to load trucks by power shovel, dragline or other loader, and 10 cts. per mile for hauling.

Otto S. Hess—"County Graveling and Black Topping Program for Orphan Streets"; *Roads and Streets*, February.

Sidewalks Adjacent to Curbs

Building sidewalks adjacent to curbs has many objectionable features. There will be steps where each driveway crosses it, which will not be lighted at night, and the slope of the driveway is uncomfortable to walk on, and dangerous when icy or wet. Such a sidewalk is hazardous for children riding tricycles, scooters, roller skates, etc. Since vehicles may mount onto it, it should be 6″ thick instead of the regular 4″. Melting snow, dirty water, etc., will be splashed onto it from the gutters. At street crossings, the pedestrian must either cross the roadway at the widest part or detour to the property line, and back again after crossing. Wire companies' poles and street light standards would have to be moved back beyond the walk.

L. K. White—"Where Should Sidewalks Be Placed?"; *Am. City*, February.

Traffic Trends in 1947

Total travel of motor vehicles in 1947 is estimated as 371 billion vehicle-miles, of which 187 billion was on rural highways and 184 billion on urban roads and streets. Passenger cars accounted for more than 300 billion vehicle-miles of the total, buses 4 billion, and trucks and combinations 66 billion. In every category these totals were greater than in any previous year. Total travel in 1947 exceeded that of 1946 by 9 percent and was 11 percent more than in 1941. The increase in travel of trucks and combinations was more than twice that of passenger cars, the former rising in 1947 to 18 percent above 1946, the latter 7 percent.

The average vehicle traveled 9,831 miles in 1947, using 746 gallons of gasoline at a rate of 13.19 miles per

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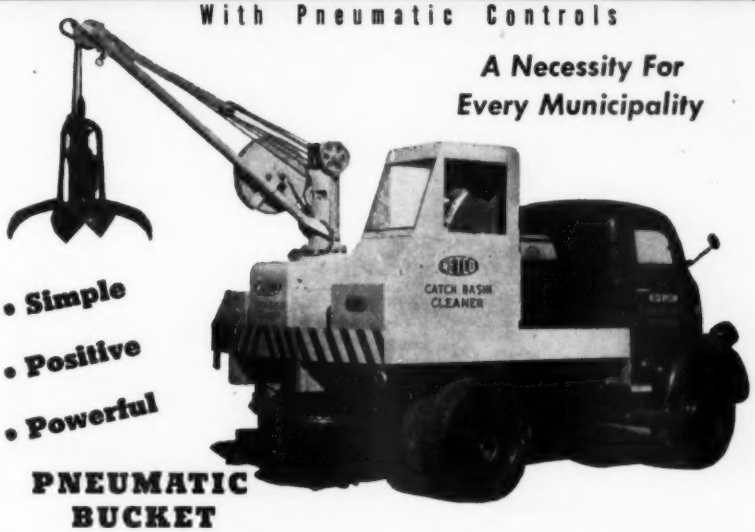

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gallon. After the wartime decline, average annual automobile travel rose in 1946 to 7 percent more than the 1941 level, but in 1947 dropped back to 5 percent above 1941. Average annual truck travel, while showing a steady recovery, had in 1947 only reached 93 percent of the 1941 level.

G. P. St. Clair—"Trends in Motor Vehicle Travel, 1947; *Public Roads*, March.

Total *rural-road* traffic in 1947 broke all previous records, exceeding the previous high in 1946 by almost 10 percent. Peak summer travel was 7 percent greater than in 1941, previous record year for that season.

Travel on the main rural roads of the country amounted to more than 137 billion vehicle-miles, of which almost 80 percent was by passenger cars. Ton-mileage carried by commercial vehicles increased 21 percent for the second consecutive year. Reversing a previous trend, a slightly larger percentage of these vehicles were found to be carrying loads in 1947. Average carried loads remained about the same as in 1946.

The use of heavy commercial vehicles continued to increase, truck-combination travel being 21 percent greater than in 1946. The rise in frequency of heavy gross weights has apparently been halted, but the frequency of heavy axle loads was almost one-fifth greater in 1947 than in the previous year.

Thomas B. Dimmick — "Traffic Trends on Rural Roads in 1947"; *Public Roads*, March.

Ditch Cleaning On Missouri Highways

In Missouri the motor grader is found to be the best and most economical unit for removing material from ditches to shoulder, although when ditches are wet, a track-type tractor and pull grader are used. For loading the windrowed dirt into trucks, hand loading used to cost 25 to 30 cts per cu. yd.; front-end loaders reduced this to 11 or 12 cts.; and during the past 2 or 3 yrs. the cost has been reduced as low as 3 cts by use of continuous belt-type loaders. In March 1948 a special crew was organized for the Kansas City division, using a 75 hp crawler tractor, a 12-ft. pull grader with bankslope attachment, a 75 hp motor grader, a continuous belt-type loader, and 4 or more trucks. The crew comprised 4 equipment operators, 4 truck drivers, a foreman, and 2 to 4 laborers. First the tractor-pulled blade cleaned the ditch to the proper grade. The motor grader windrowed the dirt at the quarter point, where it was picked up by the loader; then went back and, using the bank-sloper, cut down the backslope and made another pull along the inslope. The cost of dirt moved, loaded and hauled averaged somewhat less than 41 cts per cu. yd.

Rex M. Whitton—"Use of Proper Equipment Makes Ditch Cleaning Economical Job"; *Better Roads*, February.

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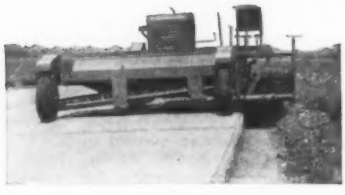

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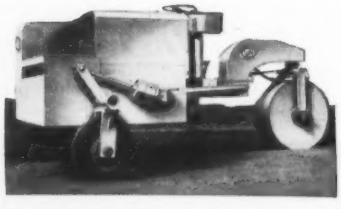

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BIBLIOGRAPHY

American City

Cradled Tile Culverts. By *S. M. Madancy*, Rd. Design Engr., Allegheny Co., Pa. February, Pp. 76-77.

Where Should Sidewalks Be Placed? By *L. K. White*, City Engr., Wichita, Kans. February, Pp. 108-109.

Detroit Resurfaces Sheet Asphalt Surfacing Over Abandoned Street Car Tracks. By *C. H. Brown*, Mich State H'way Dept. March, P. 112.

Better Roads

Highway Plans and Urban Growth. By *Robert B. Mitchell*, Research Prof., Columbia Univ. February, Pp. 25-26, 32.

More Efficient Cleaning of Ditches. Comments by county superintendents. *J. Bruce Orr, R. L. Schoenberger, Lynn E. Johnson, M. F. Johnson*; and county engineers *G. W. Deibler, T. H. Dennis, Ray Robinson, F. C. Frear, J. C. McLean*; *Geo. W. Phillips*, state maint. engr. and *Ernest D. Breuning*, Co. R'd. Comm'r. February, Pp. 29-31, 40.

Use of Proper Equipment Makes Ditch Cleaning Economical Job. By *Rex M. Whitton*, Engr. of Maint., Mo. H'way Dept. February, Pp. 31-32.

New Hampshire Modernizes Plant. (Garage). By *E. M. Sawyer*, Equipment Engr., State H'way Dept. February, Pp. 36, 38.

California Highways and Public Works

High Costs Seriously Retard State Highway Building Program. By *Richard H. Wilson*, Asst. State H'way Engr., *Henry C. McCarty*, Office Engr., and *Richard R. Norton*, Asst. Office Engr., Div. of H'ways. Jan.-Feb., Pp. 1-9.

Stores Department Embodies Best Commercial Practices for Economy. By Mil-

ton Harris, Stores Engr. Jan.-Feb., Pp. 10-16, 64.

New Santa Barbara Freeway Will Eliminate Traffic Congestion. By *John M. Chaffee*, Dist. Office Engr. Jan.-Feb., Pp. 27-29, 55.

Civil Engineering

Why Bridges Fail in Floods By C. J. *Posey*, Prof. Univ. of Iowa. February, Pp. 42, 90.

Contractors Record (England)

The Possibilities and Limitations of Soil Stabilization in Road Construction. By *Leonard John Murdock*. Feb. 9, Pp. 19-24; Feb. 16, Pp. 20-25.

Engineering News-Record

Highway Opens Quebec Industrial Area. By *Ernest Gohier*, Chf. Engr., Quebec Dept. of Roads. Feb. 17, Pp. 74-75.

Municipal Engineering (England)

Maintenance of Roads, With Particular Reference to Mechanical Aids. By *R. M. Finch* and *R. R. W. Grigson*. Feb. 25, Pp. 82-85.

Public Roads

Highway Safety: Driver Behavior—Key to Safe Highway Design. By *Thos. H. MacDonald*, Com'r of Public Roads March, Pp. 129-137.

The Effect of Tax Increases on Gasoline Consumption. By *E. M. Cope*, Chf. H'way Statistics Section, and *L. L. Liston*, Asst. H'way Economist, P. R. A. March, Pp. 138-144.

Traffic Trends on Rural Roads in 1947. By *Thomas B. Dimmick*, H'way Economist, P. R. A. March, Pp. 145-155.

Trends in Motor Vehicle Travel, 1947. By *G. P. St. Clair*, Chief of Div. of Financial and Administrative Research, P. R. A. March, Pp. 156-160.

Public Works

How Will High Costs Affect the Highway Program. By *Richard H. Wilson*, Asst. State H'way Engr., *Henry C. McCarty*, Office Engr., and *Richard R. Norton*, Asst. Office Engr., Calif. Div. of H'ways. March, Pp. 19-21, 60.

Widening Farm-to-Market Roads by Force Account. By *Adam M. Noll*, Maint. Engr., Md. State Roads Comm. March, Pp. 33-34.

Pavement Thickness for Airport Runways. March, Pp. 42, 44.

Laying an Oil Mat by Force Account. By *Wally M. Hector*, Co. Engr., Klamath Co., Ore. March, P. 52.

Roads and Streets

County Graveling and Black Topping Program for "Orphan" Streets. By *Otto S. Hess*, Engr.-Mgr., Kent County Road Com'n. February, Pp. 55-57, 60, 62.

Ditch Enclosure Through Small City. February, Pp. 68, 104.

How We Whipped Sand and Water on the Outer Banks (N. C.) Job. By *W. Vance Baise*, N. C. State H'way Engr. February, Pp. 70, 72.

Hydrated Lime for Stabilizing Roadway Materials. By *Chester McDowell*, Soils Engr., Texas H'way Dept. February, Pp. 81, 82, 84.

The Surveyor (England)

Some Impressions of Roads in the United States. By *W. P. Andrews*. Feb. 25, Pp. 115-116.

Wegen (Holland)

Verkeersbeveiliging met Prismo-Verf. January, Pp. 13-16.

Eggshell Deposits in Sewer Lines

Experiments are being conducted at the University of Texas by K. W. Cosens and E. J. Hanemann on the velocities required to transport kitchen ground eggshells. Indications are that a minimum mean velocity of 0.7 ft. per second is required for an 8-inch pipe; 1.0 ft. per second for 6-inch; and 1.4 ft. per second for 4-inch. Eggshell has a specific gravity of 2.3 and quickly settles at low velocities.

Lagoon Treatment of Industrial Wastes

Lagoons have been used for the treatment of industrial wastes successfully, according to the 1947 report of the Maryland Department of Health, which has just been issued.

The Whiteford Packing Company, in 1946, constructed a lagoon into which wastes from corn processing were discharged after passing through a 40-mesh rotary screen and being treated with sodium nitrate. During that packing season wastes produced in processing other vegetables, including peas and beans, were discharged directly into the small creek adjacent to the plant. In 1947 the construction of a second lagoon allowed all processing wastes, instead of entering the creek, to be treated with sodium nitrate and discharged into two lagoons, which were large enough to hold the total volume of wastes produced during the entire year. This method of waste treatment was entirely satisfactory.

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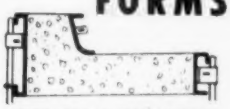

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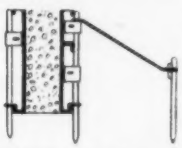

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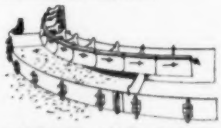

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Analytical data indicated that the BOD of wastes in the lagoon reached a maximum of about 700 p.p.m. in 1947 as compared with more than 2,000 in 1946. After the 1946 packing season, the BOD of lagoon wastes was not reduced enough to permit discharge into the creek until the following April, whereas in December, 1947, the BOD of the lagooned material equaled that reached in March following the previous year's operations.

Plant officials of a distillery at Loreley constructed lagoons to receive stillage and added sodium nitrate before the waste entered the lagoons. It is believed this is one of the first experiments in the application of sodium nitrate to distillery waste prior to lagooning. Odors were materially reduced, but more complete data must wait on full-scale operation of the distillery.

1948 Operation of Chicago's South District Water Filtration Plant

This year there was begun the publication of a mimeographed pamphlet called *Pure Water*—"A monthly publication to promote in-service training among employees of Chicago's South District Filtration Plant." In the February issue, H. H. Gerstein, Chief Filtration Chemist, gives a summary and analysis of the operation of the plant during 1948. During the year the construction of the plant was practically completed, the parts placed in operation during the year being sludge scrapers for each of the three settling basins, sludge pumping equipment, washwater transfer pumps, machine shop equipment, and certain architectural features.

"The use of the sludge scrapers," Mr. Gerstein says, "will reduce the frequency of shutdowns of the settling basins for cleaning. It is expected that basin cleaning will now be required at intervals of every 6 months instead of every 3 or 4 months as was necessary prior to installation of the scrapers."

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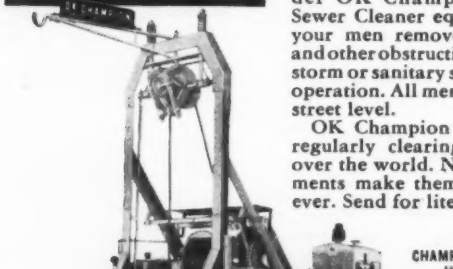

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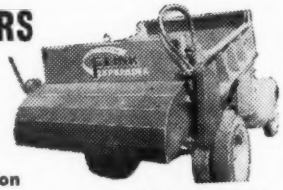

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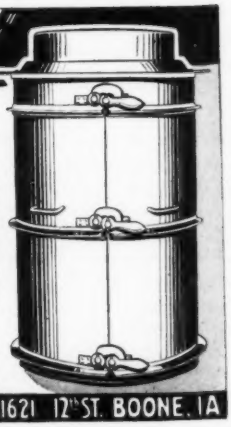

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A total of 116,828,530,000 gal. of water was pumped during 1948 by the low-lift pumps and received chemical treatment, or an average of 319 mgd. The maximum *hourly* flow from the filtered water reservoirs was at the rate of 512 mgd, at 9 P.M. on Aug. 23, and the maximum *daily* amount treated was 405.7 m.g. on Aug. 25.

The total cost of treatment per million gallons, including salaries, chemicals, power, fuel, materials and others, averaged $10.65; which was approximately 25% more than in 1947 because of increased costs and more intensive treatment. The average cost of chemicals was $3.21 per mg., of which the chlorine cost was 50c, aluminum sulfate $1.20, activated carbon $1.29, lime 13c, sodium silicate 5c, and miscellaneous chemicals 4c. The dosage of activated carbon averaged 24 lb. per mg., reaching a maximum daily average of 262 lb., when odors were greatest.

The chemical laboratories examined 147,727 samples and the bacteriological laboratories 53,053.

Research studies were carried on by use of the electron microscope and accelerated culture media to develop methods for shortening the time required for determining the coliform index of water.

Highway Construction Details on a Freeway

A freeway recently constructed through Santa Barbara, Calif., consists of two 12-ft. lanes on each side of a 36-ft. curbed median strip. The soil here had low relative compaction, making it necessary to remove it to a depth of 2½ ft. below profile grade, compact the exposed surface, and bring it up to grade with imported borrow. The excess cost of this was partly offset by using this removed soil to construct the top of the dividing strip and areas between the shoulders and the right of way, since it was suitable for use as top soil.

Road Sweeping Magnets

Last year we had inquiries from our readers concerning the availability of magnets for removing nails, pieces of steel and other tramp iron hazards from roads, air fields and other paved surfaces. With the departure of ice and snow and increase in travel, road officials may take renewed interest in the subject. To such we will gladly furnish names of firms which furnish "road sweeping magnets," designed for mounting on a truck and obtaining power from a portable engine-generator set.

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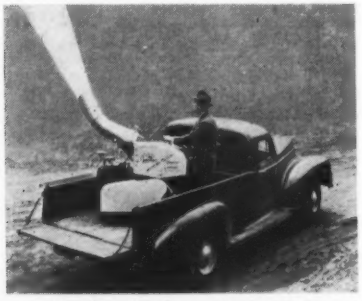

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Useful Small Tractor, Plow, Grader and Roller

A tractor with a 4 hp engine is the base for this useful tool. It can be equipped with a cutter bar or a gang mower; with an angled plow blade which plows 42 ins. wide; with a dump cart which holds approximately a third of a yard; with a grading attachment identical with the snow plow; with a spreader for sand, seed or fertilizer, spreading 3 to 12 ft. wide; with a roller weighing 530 lbs. which will roll 4 ft. wide; and with a rotary broom which sweeps 42 ins. wide. *The Flink Co., Streator, Ill.*

Use coupon on page 85; write in No. 4-2

Large-Volume, Light-Weight Asphalt Mixer

Weighing only 1,000 pounds, this "multi-pug" asphalt mixer has a capacity of 1 ton of mix per minute, but it can readily be moved around by one man. Aggregate and asphalt are proportioned volumetrically. As a stationary plant, this mixer can be used at either end of a belt conveyor, under a bin or at the discharge of a bucket conveyor. It can be adapted for use as a "mix-spread" unit, discharging onto the road surface and being fed from a dump truck. It will handle emulsified asphalt, cutback or tar; and if aggregates are dried and heated, hot asphalt may be used. Suitable for new construction, wedge courses, patching or base construction. Larger size units are available. Fuller information from *K. E. McConnaughay, West Lafayette, Ind.*

Use coupon on page 85; write in No. 4-3

Equipment and Material Handling Trailer

This is the Model T-10, flat bed, 2-axle, front-loading trailer designed for moving power shovels, rollers, tractors, bulldozers, machinery, pipe, reinforcing steel and other materials. It can be hauled by any kind of vehicle—truck or tractor. Loading height is 24". A folder is available that gives detailed information. *Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.*

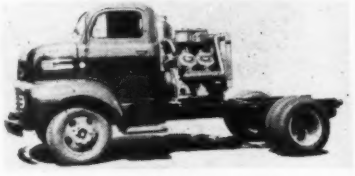
Use coupon on page 85; write in No. 4-4

Finding Out How Loud That Noise Is

Easy and accurate measurement of sound levels is possible with this flashlight size sound meter, which covers the range from 34 to 140 db above the standard ASA reference level. It weighs only 2 pounds, including batteries, but is said to give the same performance as larger models. *Hermon Hosmer Scott, Inc., 385 Putnam Ave., Cambridge 30, Mass.*

Use coupon on page 85; write in No. 4-5

This is all you need to tell how loud that noise really is.



The Davey 160-ft. compressor is operated by a power take-off.

Highly Portable 160-Ft. Air Compressor

A new 160-ft. air compressor can be mounted on a truck and operated by a power take-off, thus eliminating the need for a separate driving engine. The V-type compressor has three low pressure cylinders and one high pressure. It is 46" long, 67" wide and 50" high. Weight is 1600 pounds. *Davey Compressor Co., Kent, Ohio.*

Use coupon on page 85; write in No. 4-6

A Loader to Use With Jeeps

This should be a handy unit for smaller communities for light loading, street repair and similar work. A bull-

Mounted on a jeep, this tool loads and bulldozes.

dozer blade or a bucket can be attached to a jeep, these tools being interchangeable. The dirt and sand bucket holds a third of a yard, and the bucket can be elevated 9 ft. The snow scoop is 6 ft. wide, 32 ins. deep and 21 ins. high. The bulldozer blade is 6 ft. wide and 20 ins. high and may be set at any of

four pitches to scrape, level, or c... These units are equipped with hydraul... balance control. Write *Mahl Equipment Co., Standard Iron Wire Works, 2930 North Second St., Minneapolis 11, Minn.*

Use coupon on page 85; write in No. 4-7

A New Chlorine Dispenser

Rato-Chlor dispensers for feeding liquid chlorine are now available in 17 standard sizes, with maximum capacities from 10 pounds per day to 7500 pounds. These have 10 to 1 capacity ratio, so that the smallest model will handle as little as 1 pound per day. These dispensers are designed for use with municipal water supplies, sewerage and industrial waste treatment plants, swimming pools and similar installations. Full details are contained in Bulletin 2E-P. *Fischer & Porter Co., Hatboro, Pa.*

Use coupon on page 85; write in No. 4-8

Repair Sleeve for Bells and Joints

The Bell-Pack is a sleeve for the repair of broken cast iron bells and for the enclosure of leaking mechanical joints. Features are greatly reduced weight, complete factory assembly and increased effective inside clearance. Catalog on request. *Dresser Mfg. Div., Bradford, Pa.*

Use coupon on page 85; write in No. 4-9

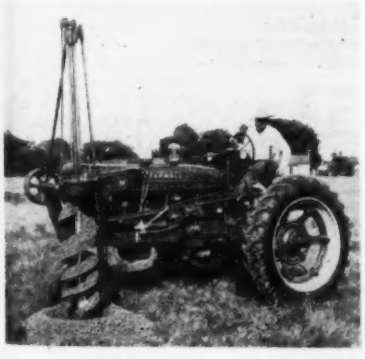
Quicker Pavement Breaking

This "midget" pavement breaker has recently had a number of improvements added. These include new higher wheels for better passage through broken concrete; all controls handy to the operator who can see the work at all times; better steering; and worm drive. *Rapid Pavement Breaker Corp., Los Angeles, Calif.*

Use coupon on page 85; write in No. 4-10

For Digging Post Holes 8-Inch to 24-Inch

With this unit, augers are available for boring holes of any size from 8-inch to 24-inch; they can dig 44, 56, 68, 80 and 108 inches deep. They are available for trucks, jeeps and tractors



This post-hole digger is excellent for guard rail and fence posts.

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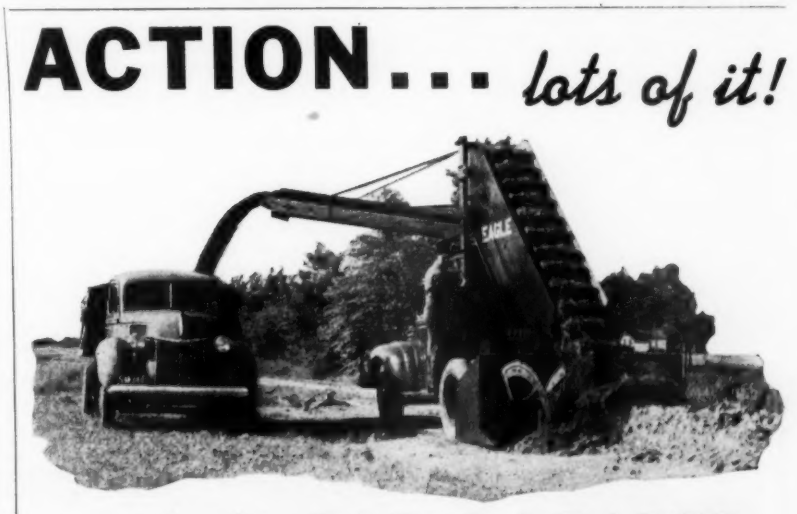
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and can be mounted in 20 minutes. Hydraulic controls regulate speed and pressure needed for any soils. *Atom Mfg. Co., Moline, Ill.*

Use coupon on page 85; write in No. 4-11

Acid and Alkali Resisting Black Paint

A new acid and alkali resistant black paint for interior or exterior use withstands action of acetic, hydrochloric and dilute sulphuric acids, or combinations of these; also resists bleach solutions, dilute caustic soda, ammonia and other alkalines. Can be applied by brush, dip or spray; glossy black finish dries in 3 hours. Three coats are desirable for maximum protection. It cannot be painted over. For other advantages and for applications write *Speco, Inc., Cleveland, Ohio.*

Use coupon on page 85; write in No. 4-12

To Keep Your Blueprints Safe

A new blueprint cabinet of heavy-gauge steel has roller-bearing drawers, with a lift compressor in front and a hood in the rear to keep the prints from curling. Two sizes are available, with drawer dimensions 25x37 and 32x43. Five drawers; plunger type lock. *Cole Steel Equipment Co., Inc., 285 Madison Ave., New York 17, N. Y.*

Use coupon on page 85; write in No. 4-13

A Compaction Roller

This compaction roller is designed to meet all compaction requirements on state and Federal jobs. Ground pressure can be varied, by loading the roller, from 218 to 670 psi. Feet have a square base which tapers off to a round tamping surface of 8 sq. ins. They will not kick up compacted dirt. *R. G. LeTourneau, Inc., Peoria, Ill.*

LeTourneau's Tournapacker.

Use coupon on page 85; write in No. 4-14

Corsair ½-Yd. 10-Ton Crane & Excavator

Mounted on a truck, and capable of moving from job to job at truck speeds, this half-yard, 10-ton, crane and excavator has a wide field of usefulness in municipal, county and state work. There are 10 speeds forward and two reverse; the unit is mounted on six wheels and has outriggers. Full data from *Wayne Crane Division, Fort Wayne 1, Indiana.*

Truck-mounted high speed ½-yd. crane for city and county work.

Use coupon on page 85; write in No. 4-15

A Truck Body for the Water Works Department

Space for meters, for tools and equipment, in fact for most anything the water works gang needs, is provided in this truck body which is designated XP-14. The illustration we have shows a Dean valve operator installed in the body, but the manufacturer says "we can supply winches, cranes, air compressors or any other special equipment." *Capital Body Co., 2171 Northwestern Ave., Indianapolis 2, Ind.*

Use coupon on page 85; write in No. 4-16

Two Scrapers and a Bulldozer

The two new 4-wheel scrapers, now in production, have a capacity of 8.5 and 12 cu. yds., struck. These have many features for faster and more efficient loading and dumping. The new bulldozer is designed to mount on an Allis-Chalmers HD-19 tractor and is intended for heavy straight bulldozing Full information on all three of these new units from *Wooldridge Mfg. Co., Sunnyvale, Calif.*

Use coupon on page 85; write in No. 4-17

NEWS NOTES

Traffic Engineering Fundamentals

The Traffic Engineering Division of the Michigan Safety Conference, which will meet in Detroit on May 19 and 20, has arranged an intensive course of instruction in traffic engineering fundamentals. It is designed for engineers, police, city officials and others. Sessions will be devoted to (1) traffic signals; (2) signs; (3) pavement markings; (4) increasing roadway capacity; (5) channelization for pedestrians and vehicles; and (6) parking.

Water Works Calendar

The 1949 Water Works Calendar, issued by the Division of Sanitary Engineering, Illinois Department of Public Health, of which Clarence Klassen is chief sanitary engineer, is now available. You'll enjoy the calendar and it may give you some excellent ideas for your own publicity and relations work.

Proportioneers' New Demonstration Trailer

It has been a good many years now that Proportioneers of Providence, R. I., have been operating a demonstration trailer; in fact, they tell us they have trailered more than 100,000 miles. A new trailer is now on the road and is scheduled to visit the Southeastern States. For further information, contact Proportioneers or any branch office.

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GET THIS NEW BOOK

New Bulletin 221 describes the recent improvements in P.F.T. Gas Safety Equipment; for better protection for boiler rooms and other installations, and longer service life for the equipments.

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BRIEFS OF USEFUL BOOKLETS

These are available from the manufacturer or by using the coupon on page 85.

Industrial Pumps:

Nagle industrial pumps are described in a 36-page bulletin, No. 4711, which includes priming data, types of impellers and other technical information. Nagle Pumps, Chicago Heights, Ill.

Diesel Power:

Bulletin 165 describes a 4-cycle, 1-cylinder diesel engine with 10-15 operating hp. This is a complete, self-contained, ready-to-operate unit for pumping or electric generation. Nordberg Mfg. Co., Milwaukee 7, Wisc.

Waste Treatment:

Infilco Inc., 325 W. 25th Place, Chicago 16, Ill., has published "Waste Treatment to Comply With Stream Pollution Control Regulations." This is intended primarily for the information of the municipal engineer or the industrial plant executive. Ask for Bulletin 70. Sent on request.

Shovel-Loader:

A new catalog describes the Hough Model HM Payloader, a 1½-yd. tractor shovel. Frank G. Hough Co., 802 E. Sunnyside Ave., Libertyville, Ill.

Clarification:

Descriptions of various types of clarifiers for water and sewage treatment are described and illustrated in a 16-page bulletin. Infilco Inc., 325 West 25th Place, Chicago 16, Ill.

Bituminous Paver:

This is a new product of Jaeger Machine Co., Columbus 16, O. It is adjustable while in motion to any width from 9′ to 12.5′, and quickly adjustable for lesser widths. It lays any material to exact thickness and desired density. It matches joints and paves flush to adjacent course, curb or gutter. Ask for catalog BP-9.

Surface Activity:

This booklet covers new services available in this field of surface chemistry. Foster D. Snell, Inc., 29 West 15th St., New York.

Insulated Piping:

Two new booklets by Ric-Wil Co., Union Commerce Bldg., Cleveland, O. "Engineering Data for Underground Steam Distribution" deals with layouts, estimating steam loads, steam flow charts, properties of steel pipe, etc. "Typical Engineering Drawings" reproduces actual drawings in a wide variety of insulated piping installations. Both sent on request.

Aerial Surveys:

A 16-page booklet gives interesting information on the potentialities of the aerial survey method and shows concrete examples of what it can do. Abrams Aerial Survey Corp, Lansing 1, Mich.

Vibrating Screen:

A 4-page folder describing a screen for waste disposal, with suggested installations and details of engineering features. Productive Equipment Corp., 2926 W. Lake St., Chicago 12, Ill.

Ready-Mix Concrete:

A new pamphlet illustrates uses of Dumpcrete bodies for handling air-entrained concrete without agitation. Action pictures show use under various conditions. Ask for your copy from Maxon Construction Co., Inc., 131 N. Ludlow St., Dayton 2, Ohio.

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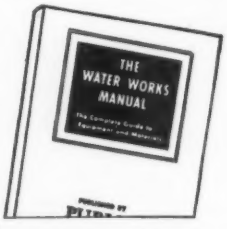

"This Manual is used extensively by our Water Department which is interested in the latest developments in equipment and materials" . . . wrote L. M. W., City Engineer of a large midwestern city.

For Water Works Information Consult your

WATER WORKS MANUAL

INDEX OF ADVERTISEMENTS

Albright & Friel, Inc.	78
Allis-Chalmers Tractor Div.	46 & 47
All Purpose Spreader Co.	74
Alvord, Burdick & Howson	78
American Brass Co.	10
Anthracite Equipment Corp.	88
Armco Drainage & Metal Prod., Inc.	19
Austin-Western Co.	9
Ayer-McCarel-Reagan Clay Co.	61
Baker, Jr., Michael	78
Banister Engineering Co.	78
Barker & Wheeler	78
Baughman Mfg. Co., Inc.	48
Black & Veatch	78
Blaw Knox Div.	75
Bogert Assoc., Clinton L.	78
Bowe, Albertson Assoc.	78
Bowerston Shale Co.	61
Briggs & Stratton Corp.	89
Brown Engineering Co.	78
Buck, Seifert & Jost	78
Buffalo Meter Co.	70
Builders-Providence, Inc.	53
Burns & MacDonnell Eng. Co.	78
B/W Controller Corp.	62
Caine Steel Co.	62
Caird, James M.	78
Capitol Engineering Corp.	78
Carter Co., R. B.	15
Carver-Stimpson Pipe Cleaning Co.	55
Cast Iron Pipe Research Assn.	16 & 17
Champion Corp.	76
Chemical Equipment Co.	71
Chester Engineers	78
Chicago Pump Company	3
Clark-Wilcox Co.	73
Coff, L.	78
Cole & Son, Chas. W.	78
Consoer, Townsend & Assoc.	78
Corson, Oscar	78
DeLeuw, Cather & Co.	78
Dempster Brothers	18
Dickey Clay Mfg. Co., W. S.	61
Dolge Co., The C. B.	54
Dow, A. W., Inc.	78
Eagle Crusher Co., Inc.	81
Enterprise Development Corp.	83
Fairbanks Morse & Co.	11
Fitch Recuperator Co.	49
Flexible Sewer-Rod Equipment Co.	42
Flink Co.	76
Frink Sno-Plows, Inc.	58
Galion Iron Works & Mfg. Co.	12
Gannett, Fleming, Corddry & Carpenter, Inc.	78
Gar Wood Industries, Inc.	59
Gilbert Associates, Inc.	78
Goff, William A., Inc.	78
Goldak Co.	88
Greeley & Hansen	78
Green Co., Howard R.	79
Greenlee Tool Co.	67
Harte Co., John J.	79
Hellige, Inc.	90
Heltzel Steel Form & Iron Co.	77
Hill & Hill	79
Hitchcock & Estabrook	79
Homelite Corp.	21
Hotel Strand	86
Huber Mfg. Co.	2
Hydraulic Development Corp.	84
Infilco, Inc.	50
International Harvester Co.	4 & 22
Jaeger Machine Co.	57
Jeffrey Mfg. Co.	20
Jones, Henry & Schoonmaker	79
Kennedy, Clyde C.	79
Knowles, Inc., Morris	79
Koch & Fowler	79
Koehring Co.	88
Layne & Bowler, Inc.	41
Lewis, Harold M.	79
Link Belt Co.	45
Littleford Bros., Inc.	57
Lock Joint Pipe Co.	91
Lozier & Co., Wm. S.	79
McCray Co., F. G.	79
McWane Cast Iron Pipe Co.	86
Metcalf & Eddy	79
M & H Valve & Fittings Co.	87
Moore & Owen	79
Murdock Mfg. & Supply Co.	90
National Clay Pipe Mfrs., Inc.	14
National Fire Proofing Corp.	61
Nye Odorless Incinerator Co.	Front Cover
Ottawa Steel Products, Inc.	43
Pacific Flush Tank Co.	82
Palmer & Baker, Inc.	79
Phelps, Inc., Boyd E.	79
Pirnie Engineers, Malcolm	79
Pitometer Company	79
Proportioneers, Inc.	65
Quinn Wire & Iron Works	76
Robert & Co., Inc.	79
Roberts Filter Mfg. Co.	54
Roots Connersville Blower Corp.	63
Russell & Axon, Cons. Engrs.	79
Rust Oleum Corp.	90
Scott & Sons Co., O. M.	81
Sicard, Inc.	8
Simplex Valve & Meter Co.	69
Sirrine & Co., J. E.	79
Skinner Co., M. B.	87
Smith & Gillespie	79
Sonken-Galamba Corp.	54
South Bend Foundry Co.	84
Speco, Inc.	84
Standard Steel Works	44
Stanley Engineering Co.	79
Sterling Machinery Corp.	84
Stilson & Assoc., Alden E.	79
Superior Engine Division	13
Taylor & Co., W. A.	87
Taylor, Henry W.	79
Texas Vitrified Pipe Co.	61
Trickling Filter Floor Institute	61
Universal Concrete Pipe Co.	64
U.S. Pipe & Foundry Co.	51
Wallace & Tiernan Co., Inc.	Back Cover
Wayer Impactor, Inc.	49
Wertz & Assoc., Emerson D.	79
Weston, L. A.	82
Wood Co., R. D.	68

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45. Automotive Hydra-Shovel digs 15 ft. above, 15 in. below grade, features independent hydraulic hoist and crowd action. Capacities 1 cu. yd. for digging solid earth, 1¼, 1½ and 2 cu. yd. for loading all types material. Get information from Dempster Brothers, Inc., 949 Dempster Bldg., Knoxville 17, Tenn.

Furnace Data on Low Cost Incineration

49. The new furnace data bulletin issued by Nye gives information on six furnace sizes which may be used in single or multiple units, plus details of special features. Use coupon or write Nye Odorless Incinerator Co., 51 East 42nd St., New York 17, N. Y.

New Traffic Barricade Is Safe and Convenient

70. A new traffic marking device is the rubber Traficone, which provides a safe, durable marker wherever traffic must be diverted. Wear-resistant cones are flexible, easily stacked. Get full details from Enterprise Development Corp., Dept. PW, 231 W. Olive St., Burbank, Calif.

Recording Meters for Parabolic Flumes

73. Engineering data on parabolic flumes and accurate companion meters for open flow water and sewage metering is given in Simplex bulletin 210. Installation data and calibration included. Write Simplex Valve and Meter Co., Dept. 4, 6750 Upland St., Philadelphia 42, Pa.

All-Electric Floatless Liquid Level Control

78. Description of operating principles and applications of B/W controls shows the simplicity and many uses of these all-electric, floatless devices. Diagrams of typical installations and engineering data all in bulletin 147 issued by B/W Controller Corp., Dept. PW, Birmingham, Mich.

Fast Floc Formation For Your Filter Plant

79. Get data on the Stuart-Carter walking beam flocer and complete bulletins on full line of water and sewage treatment equipment. Sent on request by Ralph B. Carter Co., 188 Atlantic Ave., Hackensack, N. J.

Fast, Efficient Skid-Proofing

114. Get full facts about Baughman Light-Weight Cinder Spreaders, fast operators for cinders, sand, salt, chips, etc. Free flowing at low temperatures. 9-17 cu. yd. capacity. Write Baughman Mfg. Co., Dept. PW, Jerseyville, Ill.

Here's Data on All Swimming Pool Needs

135. Well illustrated bulletin describes filters, water softeners, hydrogen ion plants, chlorine feeders and complete equipment for swimming pools etc. Copy sent on request by Dept. PW, Chemical Equipment Co., 223 Center St., Los Angeles 54, Calif.

CONSTRUCTION EQUIPMENT

Data Book on Universal Concrete Cribbing

21. Shows typical sections for designing walls, pictures many applications, specifications, etc. Get the facts today about this economical reinforced concrete cribbing. Universal Concrete Pipe Co., Dept. PW, 297 So. High St., Columbus 15, Ohio.

Methods of Installing Steel Sheet Piling

30. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Steel Co., Dept. PW, 1820 No. Central Ave., Chicago 30, Ill.

How to Keep Your Loader On the Job

50. Don't take more time to move your loader to the job than to do the work. Investigate the Eagle Truck Mounted Loader for handling gravel, sand, cinders, snow from windrows or piles. Get forms 444 and 947 from Eagle Crusher Co., Inc., Galion, Ohio.

Contractors' Pump Features Carryability

93. To find out how well a Homelite Carryable Pump handles large volumes, seepage, mud, write today for illustrated bulletin L-503 containing data of great value to all pump users. Write Dept. PW, Homelite Corp., 2102 Riverdale Ave., Port Chester, N. Y.

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95. Tables for pump size determination on every excavation job, pipe friction loss, altitude effects and lots of other valuable data are included in this comprehensive booklet illustrating the many Jaeger "sure-prime" pump applications. Get your copy (catalog P45) by checking our coupon or writing the Jaeger Machine Co., Dept. PW, Columbus 16, Ohio.

The Right Tractor For Your Job

116. Whether you need a front-end loader, snow plow, bulldozer, sweeper or mover, International wheel tractors combine correctly with allied equipment to do the job. Your choice of gasoline or diesel units is illustrated in Bulletin A-103JJ. International Harvester Co., 180 No. Michigan Ave., Chicago 1, Ill.

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120. Trucks take a pounding in construction work—that's why you need data on International Trucks that are engineered for your job. Check the coupon or write International Trucks, Dept. PW, 180 N. Michigan Ave., Chicago 1, Ill.

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34	36	38	40	41	42	45	47	48	49	50
52	53	55	59	60	64	65	67	70	73	76
78	79	82	85	91	93	95	96	98	100	103
105	106	109	110	111	112	114	116	120	121	122
123	124	126	135	136	137	138	139	142	148	

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82. Here is a complete, illustrated treatise on the Halverson-Smith process for sewage and waste treatment. Gives valuable Aero-Filter design information with expected performance data. 16 pages of helpful information. Write Yeomans Brothers Co., 1425 No. Dayton St., Chicago 22, Ill.

Packaged Sewage Treatment— Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities — 100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

For Speedy, Nuisance-Free Refuse Collection

55. The Gar Wood "Load Packer" compresses refuse into the front of the collecting body, thus greatly increasing capacity. 9, 12 and 15-yd. sizes. Described in bulletin PW-M-51, Gar Wood Industries, Inc., Wayne Div., Wayne, Mich.

Design Details for Sludge Collectors

42. Booklet No. P.W. 1742 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

How Cities Can Do Complete Sewer Cleaning From Street

98. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Power machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

Pumps Suitable For Every Purpose

100. Large size trash pumps, propeller pumps, angle-flow pumps—a type suitable for every service. A separate bulletin for each is furnished by Fairbanks, Morse & Co., Fairbanks-Morse Bldg., Chicago 5, Ill.

Do You Have the Best Possible Sludge Conditioning?

110. "Ferri-Floc," description and instructions for use in coagulation, sludge conditioning and treating industrial wastes, fully treated in a 24-page pamphlet. Tennessee Corp., 619-27 Grant Bldg., Atlanta 1, Ga.

How to Make Sewage Plant Grit Suitable for Fill, Roadways

138. The Jeffrey "Jigrit" washer does a thorough job of scrubbing grit free of organic solids. Grit is classified according to size and organics rejected with overflow. 44-page Catalog 775A describes the "Jigrit" and gives engineering data and installation views of grit and sludge collectors, chemical feeders, garbage grinders and other equipment as well. Dept. PW, Jeffrey Mfg. Co., 948 N. Fourth St., Columbus 16, Ohio.

Rust Wastes Your Money

121. You'll want data on the all-purpose anti-rust coating that can be brushed or sprayed on all metal surfaces, even those already attacked by rust. For full information on this firm, elastic coating write Rust-Oleum Corp., 2443 Oakton St., Evanston, Ill.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operting and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 712 Poplar Ave., Connersville, Ind.

An Incinerator Necessity

139. Recuperator tubes made from Silicon Carbide and "Fireclay" corebusters for maximum efficiency are described and illustrated in Bulletin 11 issued by Fitch Recuperator Co., Dept. PW, Plainfield Natl. Bank Bldg., Plainfield, N. J.

WATER WORKS

Makes Underground Pipe Installations Easy

25. One-man operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117, Greenlee Tool Co., 2044 Columbia Ave., Rockford, Ill.

Is Your City Metered 100%?

33. 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cutaway views of every part, capacity and

CORROSION RESISTING
get PERMANENCE
LASTS FOR CENTURIES

McWANE
B & S PIPE

For quick installations use McWane B&S cast iron pipe.

Easy to cut . . . handle . . . tap . . . lay. Meets rigid Standard Class 150 Federal Specifications, 500-pound test.

PROMPT SHIPMENT
4" and Larger Sizes

ALL SIZES 2" thru 12"
McWANE CAST IRON PIPE CO.
Birmingham 2, Alabama

Atlantic City's Hotel of Distinction

A Hotel Planned and Designed for Your Every Comfort . . . assuring you absolute Rest and Relaxation . . . amid an Atmosphere of Refinement . . .

Beautifully Furnished Rooms . . . Ocean Front Verandas . . . Roof-Top Solarium . . . Salt Water Baths . . . Cuisine Unsurpassed . . . Garage on Premises . . .

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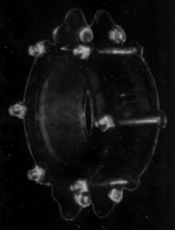
ATLANTIC CITY, N. J.

FOR REPAIRING BELL AND SPIGOT JOINT LEAKS...

SKINNER-SEAL
Bell Joint Clamp for stopping bell and spigot joint leaks under pressure. Gasket is completely sealed: at bell face by Monel Metal Seal band—at spigot by hard vulcanized gasket tip.

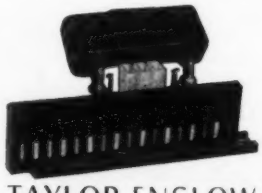
AND BROKEN MAINS

SKINNER-SEAL
Split Coupling Clamp. One man can install in 5 to 15 minutes. Gasket sealed by Monel band. Tested to 800 lbs. line pressure. A lasting repair. 2" to 16" incl.



M. B. SKINNER CO.
SOUTH BEND 21, INDIANA, U.S.A.

Chlorine DETERMINATIONS
—easy for everyone with



TAYLOR-ENSLOW SLIDE CHLORIMETER

. . . No special training necessary. The accuracy, compactness, durability and portability of the Taylor-Enslow Slide chlorimeter makes it ideally suited to on-the-spot determinations of the free or residual chlorine content of water, sewage and industrial wastes.

Taylor-Enslow slides are molded of plastic . . . contain a complete set of 9 liquid color standards, all of which carry an unlimited guarantee against fading. Two slides are available; 0.0 to 1.0p.p.m. and 0.0 to 3.0p.p.m. of chlorine. Combination pH and Chlorine sets, and complete Taylor Water Analyzers are also available.

READ THIS VALUABLE BOOK—FREE

96 pages of authoritative general information for water and sewage engineers as well as describing Taylor sets. Write for your copy today—see your dealer for equipment.

W. A. TAYLOR AND CO.
7304 YORK RD. • BALTIMORE 4, MD

size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

Do Your Water Mains Need Cleaning?

38. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

Locate Mains and Services Without Digging

40. The M-Scope is an electronic method of definitely locating a metal pipe. By proper manipulation the depth of cover can be determined. It is battery operated and readily carried by one man. Used as directed in this 16-page booklet, it is easy to determine exact locations of valve and meter boxes. Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.

Solve Corrosion Problems With This Special Alloy

41. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

Eliminate Taste and Odor From Your Water

53. Technical pub. No. P.W. 213 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with Break-Point Chlorination. Send free to any operator requesting it.

Hydraulic Pipeline Scraper For Water and Sewage Mains

59. For a copy of this compact folder on a hydraulic pipeline scraper which cleans all kinds of mains from 4 inches to 14 inches write to Dept. PW, Carver-Stimpson Pipe Cleaning Co., Walters, Okla.

Chem-O-Feeders for Automatic Chemical Feeding

60. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation, treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. %, 96 Codding St., Providence 1, R. I.

Helpful Data on Hydrants

64. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Dept. P.W., Anniston, Ala.

Cast Iron Pipe and Fittings For Every Need

65. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. PW, Burlington, N. J.

Do You Ever Have Leaks to Fix?

124. You'll want to know about the full line of "Skinner-Seal" clamps for repairing bell and socket joint leaks and broken mains. Step-by-step procedures are illustrated in catalog 41, a handsome 40-page presentation which shows applications of all fittings. Write M. B. Skinner Co., Dept. PW, South Bend 21, Ind.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Mechanical Joint HYDRANTS and VALVES

Also Hub Ends Flanged or Screwed

M & H furnishes both regular type A.W.W.A. fire hydrants and special Traffic Model designed to yield at the ground line under impact.

Write for Catalog No. 34

M. & H. PRODUCTS
Fire Hydrants
Gate Valves
Tapping Valves
Special Castings
Tapping Sleeves
Check Valves
Floor Stands
Extension Stems
Mud Valves
Flap Valves
Sludge Shoes

M & H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA

Flow Meters With Many New Features

91. The new Propelflo meter for main-line metering introduces many new features you will want to look into. Send for latest bulletin today. Builders Providence, Inc., 16 Codding St., Providence 1, R. I.

Just Press the Button— It Does the Rest

103. Automatic Filter Operation. The Robotrol automatically back washes, rewashes and returns the filter to service. Illustrated Engineering Bulletin 1230. Infilco, Inc., 325 W. 25th Place, Chicago 16, Ill.

Well Water Systems Built to Last

105. Layne pumps are built for wells ranging from 4" to 36" diameter and in capacities from 50 to 16,000 gpm. Full engineering data and many installation views are given in 32 page Pump Bulletin 4-42. Layne and Bowler, Inc., Memphis, Tenn.

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., P.O. Box 269, East Orange.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

POWER AND LIGHT

Diesel Engines to Help You Build Profits

27. A new 28 page catalog just off the press titled "Superior Stationary Diesel Engines," is packed with facts that will help you build profits. For your copy write to Superior Engine Division, National Supply Company, Springfield, Ohio.

STREETS AND HIGHWAYS

Strong, Speedy, Low-Cost Maintainer Has Many Uses

22. BG Maintainer, a powerful speedy, low-priced machine for light road maintenance. Full details in illustrated folder. Huber Mfg. Co., Dept. PW., Marion, Ohio.

Your Tractor Converted To Front End Loader

24. Need a front end bucket loader that can be converted into a light plow or grader in a matter of minutes? Write for this folder that illustrates, describes and gives specifications of the Ottawa Industrial Front End Loader for industrial tractors. Loads earth, sand, gravel and other bulk material. Quick change over can be made to light bulldozer, V-type snow plow, grader or maintainer with attachments. Write Dept. PW, Ottawa Steel Products, Inc., Ottawa, Kans.

Solve Your Drainage Problems This Easy, Permanent Way

28. Useful new 60 page catalog on standard corrugated pipe, multi-plate pipe and arches and 18 other drainage and related products for culverts, sewers, subdrains, flood control, airports, water supply and other types of construction. Ask for "Armco Products for Engineering Construction," Armco Drainage and Metal Products, Inc., Dept. PW, Middletown, Ohio.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

New Unit Cleans Catch Basins in a Jiffy

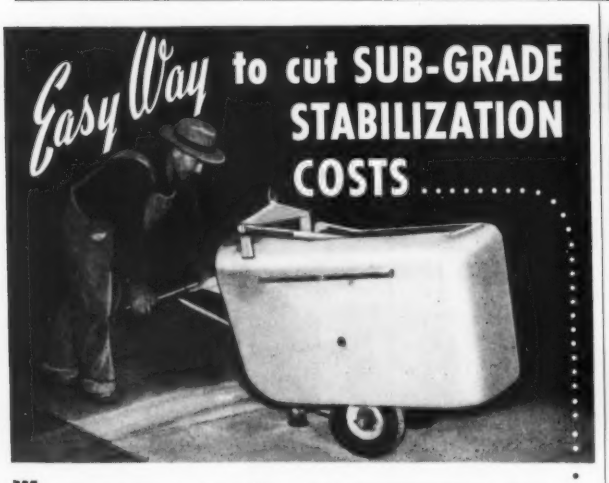
34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Data on All Types of Bins and Batching Plants

47. Good illustrations and useful data on all types of Heltzel Highway Bins, for truck mixer charging, bulk cement plants, enclosed bucket elevators, belt conveyors, etc. Heltzel Steel Form & Iron Co., Dept. P.W., Warren, O.

Speed Your Work With These Powerful Motor Graders

48. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully de-



Where pavement, sidewalks, curbs or gutters are beginning to settle, Koehring Mud-Jack is an easy, low-cost answer to your problem. This handy unit pumps inexpensive soil-cement slurry into small holes drilled through slab . . . raises structure to original level . . . leaves firm, lasting sub-grade support.

NO INCONVENIENCE TO PUBLIC . . . no traffic detours necessary. Koehring No. 10 Mud-Jack, illustrated, is ideal for city work . . . portable as a wheelbarrow. Bigger No. 50 Mud-Jack is also available for preventive maintenance or repairs on highways. For complete information write to

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KOEHRING HEAVY DUTY
KOEHRING MUD-JACKS*
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THE GOLDAK *Featherweight* MODEL 87
PIPE LOCATOR

FINDS THOSE PIPES!

- Gives EXACT location of buried pipes, mains, services, tees, ells, stubs, etc.
- Easy, reliable one-man operation
- Compact, ruggedly built
- Featherweight — only 11 lbs. complete
- Guaranteed superior performance

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ANTHRAFILT
Trade Mark Reg. U. S. Pat. Off.

As a Modern Filter Medium Has Outstanding Advantages Over Sand & Quartz Media

1. Length of Filter runs doubled
2. Only about one half as much wash water required
3. Less coating, caking or balling with mud, lime, iron or manganese
4. Filters out of service less because of shorter wash cycle
5. Better removal of basteria, micro-organic matter, taste and oder
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9. A perfect supporting media for synthetic resins
10. An ideal Filter media for industrial acid & alkaline solutions
11. Decidedly advantageous for removal of fibrous material as found in swimming pool filters

Additional information, recommendations and quotations furnished upon request by

PALMER FILTER EQUIPMENT COMPANY
822 East 8th Street, P. O. Box 1655, Erie, Pennsylvania
Representing
ANTHRACITE EQUIPMENT CORPORATION
Anthracite Institute Building, Wilkes-Barre, Pennsylvania

scribed in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

Latest Maintenance Equipment For Blacktop Roads

52. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

Standard Forms for Concrete Pipe

67. Concrete pipe for sewerage, drainage and culvert projects can be produced quickly and uniformly with Quinn Standard concrete forms. Data on forms for 12" to 84" tongue and groove or bell end reinforced pipe from Quinn Wire and Iron Works, 1621 12th St., Boone, Iowa.

Tractors for Counties, Cities and Contractors

76. An attractive 24-page catalog portrays the Allis-Chalmers HD-5 crawler's abundant capacity and ability to meet the variable needs of counties, townships and contractors. Photographs and cutaway views illustrate its rugged construction and simplified maintenance. Use coupon or write Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee 1, Wisc.

How to Beat the Weed Problem

85. Be sure to investigate weed control with selective chemical weed killers. Ask for bulletins on Dolge products that will rid roadsides, parks and lawns of the weed nuisance. C. B. Dolge Co., Dept. PW, Westport, Conn.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Light Weight Machine Does Work of Heavy Roller

111. For compacting hot or cold patching material be sure to investigate the Wayer Impactor, 2,000 blows per minute tamps, finishes and cures. All data in Bulletin 25-8. Wayer Impactor Sales Co. 12 N. Third St., Columbus 15, Ohio.

How to Get Good Grass For Roadside Shoulders

123. For every step in lawn care and seasonable maintenance hints be sure to read "Lawn Care," an interesting periodical sent without obligation by O. M. Scott & Sons Co., 81 Spring St., Marysville, Ohio.

How to Speed Curb and Gutter Work

126. Here's a 24-page bulletin illustrating form set-ups for every type of curb and gutter work. Send for Bulletin 2259 and learn how to speed up the job with Blaw-Knox Steel Street Forms. Write Blaw-Knox, Dept. PW, Farmers Bank Bldg., Pittsburgh 22, Pa.

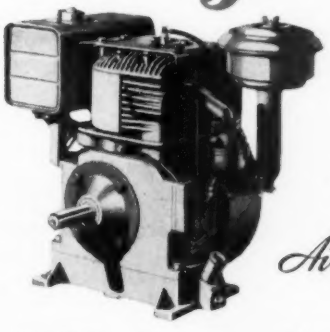
Uniform Spreading 2 to 10 ft. Wide

136. Saves labor, spreads 0 to 100 lbs. a sq. yd., dusts up to 1" material forward, reverse, on curves, hills or straightaway. Assures uniform, even density of spread. Write for bulletin: Dept. PW., All Purpose Spreader Co., Fuller Road, Elyria, Ohio.

For Speedy Bituminous Maintenance Jobs

142. The Standard Steel trailer-mounted pressure distributor and tank is easy to move for emergency patching, all maintenance. Write for bulletin "S-J" on this fast acting, low cost equipment. Standard Steel Works, Dept. PW, North Kansas City, Mo.

It will pay you to select Briggs & Stratton Engines



"Preferred" Air-Cooled Power

You'll get *top* performance from your equipment when you choose Briggs & Stratton as your gasoline power!

Here's why. Briggs & Stratton engines give you the advantages of the most modern 4-cycle, single-cylinder, air-cooled design—the result of over 30 years of continuous research and production. They're precision-built of finest materials. They're strong, tough, durable. They cost less to operate.

That's why users and dealers ask for Briggs & Stratton power when they want gasoline powered equipment, appliances or machinery. That's why Briggs & Stratton powered equipment is easier to sell—and preferred power to own. Choose Briggs & Stratton engines for your requirements. They're today's outstanding power value.

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4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES
World Wide FACTORY SUPERVISED SERVICE

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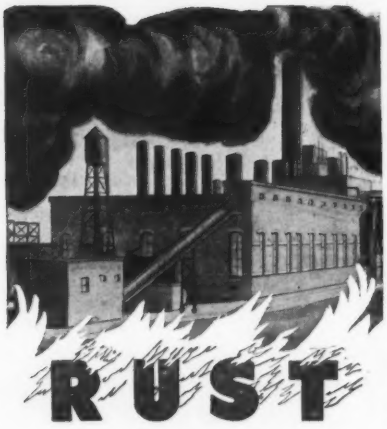


RUST

Is a "Slow Fire" That Is Costly to You

Where metal is used — RUST is a constant threat. Unless all rust-producing conditions are fully checked by adequate protection, much property and equipment will "burn away" slowly — just as surely as if consumed by fire. Water works, sewage disposal plants, utility equipment and other structural metal surfaces are particularly vulnerable to the deadly scourge of rust. *The faster rust destroys — that much sooner will costly replacements or repairs be required.*

Stop Rust WITH RUST-OLEUM

It's a proved product (an exclusive formula) that gives *long-lasting* protection. Rust-Oleum coats metal with a tough, pliable film that dries to a firm, rust-preventive coating. It defies rain, snow, dampness, fumes, ordinary weathering and other destructive elements. Applied to metal where rust has already started, Rust-Oleum guards the structural strength of your steel and *saves it from further damage*. You don't have to remove all the rust. Available in aluminum, white and colors. Rust-Oleum is a rust preventive that is decorative, too!

● WHAT ARE YOUR RUST PROBLEMS?

We'll gladly send you specific recommendations for Rust-Oleum applications upon request. Write for complete Rust-Oleum data without cost or obligation, or see our catalog in SWEET'S.

Rust-Oleum is sold by industrial distributors in most principal cities.

RUST-OLEUM CORPORATION

2443 Oakton Street Evanston, Illinois

NEWS OF ENGINEERS

Harold B. Gotaas, Professor of Sanitary Engineering, University of California, has been made chairman of the Division of Civil Engineering. Professor Gotaas joined the University in 1946, after distinguished service as Colonel in the Sanitary Corps of the Army.

F. D. Stewart, Assistant Chief Engineer of the Ohio State Department of Health, died March 10 at his home in Columbus. Mr. Stewart was an outstanding engineer and administrator. During the war he served as chief sanitary engineer for the army in Iran and later was chief sanitary engineer for the 5th Service Command. He held the rank of Lt. Col.

Scott Johnson, long-time state sanitary engineer of Missouri, and recently honored for his outstanding service, died of a heart attack on March 13.

Eric Hammarstrom, formerly with Worthington Pump & Machinery Corp., has joined the staff of the Komline-Sanderson Engrg. Corp., Ridgewood, N. J., specialists in sludge dewatering and drying.

Ralph G. Caouette has been appointed general manager of the Pittsburgh Equitable Meter Division of Rockwell Mfg. Co., Pittsburgh.

Associations

The tenth annual water conference of the Engineers' Society of Western Pennsylvania will be held at the Hotel William Penn, Pittsburgh, Oct. 17-19. H. M. Olson is chairman.

The eighteenth annual Georgia Water and Sewage School will be held at Georgia Institute of Technology, Atlanta, Sept. 21 to 23.

Engineering Positions

California is asking for applications for associate and assistant sanitary engineers. Salary ranges are $341 to $415 for assistants and $415 to $505 for associates. Local residence not required; applications must be filed before April 30. Write State Personnel Board at Sacramento, San Francisco or Los Angeles.

Applications for the position of traffic engineer in the City of East Orange, N. J., are desired. Those interested can obtain full information by writing to Theodore J. Young, City Engineer, East Orange, N. J.

ANNOUNCING

CIVIL SERVICE EXAMINATION

for

SUPERINTENDENT CITY WATER WORKS

CEDAR RAPIDS, IOWA

Qualifications: Age 30 to 50 years. Engineering degree and ten years experience or BS degree and 12 years experience.

Starting salary: $6,000 to $7,500.

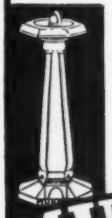
Write Civil Service Commission, City Hall, Cedar Rapids, Iowa, for applications and information Deadline, May 20, 1949.

APPRECIATED

The public approves every installation of a MURDOCK Outdoor Drinking Fountain.

To make more water available to the public in more places is blessing mankind.

A cool drink, fresh from the water main, on a hot day, is appreciated beyond the scope of words bythirsty souls.



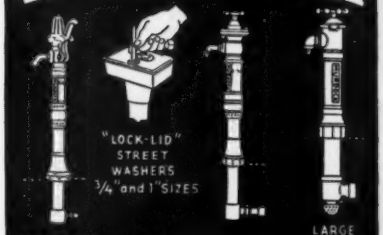
Pedal acting; self-draining. No mess around fountain.

"It Pays to Buy MURDOCK."

The Murdock Mfg. & Supply Co.

Cincinnati 2, Ohio

MURDOCK


"LOCK-LID" STREET WASHERS 3/4" and 1" SIZES
SELF-CLOSING ANTI-FREEZING HYDRANT
ANTI-FREEZING COMPRESSION HYDRANT
LARGE ANTI-FREEZING HYDRANTS 1½" TO 2" INCLUSIVE

FOR BETTER

pH Control and WATER TESTS

there is nothing like

NON-FADING GLASS COLOR STANDARDS

Pocket Comparator No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of the technique, and compactness of the apparatus are exclusive features of Hellige Comparators not found in any similar outfits.

WRITE FOR BULLETIN No. 602

HELLIGE

INCORPORATED

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HEADQUARTERS FOR COLORIMETRIC APPARATUS